

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES

Fourth Series

Vol. XXVI, No. 12, pp. 419-466, 10 text figures

April 28, 1950

SNAKES OF THE KIUKIANG-LUSHAN AREA,
KIANGSI, CHINA

BY

T. PAUL MASLIN

*University of Colorado
Boulder, Colorado*

Large collections of any group of animals from a circumscribed area are of particular interest from a taxonomic and ecological point of view because they provide precise evidence of the animals' choice of habitat and they fairly adequately indicate the fauna of the area.

The present paper is a description of such a collection consisting of 403 snakes taken in the vicinity of Lushan, a small mountain range ten miles south of Kiukiang, Kiangsi, China, in the course of my stay there in 1935 and 1936. The importance of this collection lies in the fact that, though it is from an area with a herpetological history dating from 1871, it is the first comprehensive collection made there. Furthermore, it represents the fauna of a region with diverse habitats, including such widely different ecological situations as hot humid plains and mountains high enough to support purely montane species.

Lushan is a range of mountains rising as a promontory from the South Yangste Hills (Cressey, 1934, p. 323). This range extends north and east along the western side of Poyang Lake, ending abruptly ten miles south of the Yangste River near Kiukiang, Kiangsi. It is isolated on three sides from other mountain areas, but on the south low hills connect it with the South Yangste Hills. The promontory, arising abruptly from the alluvial plains, is approximately fifteen miles wide and forty miles long. It averages between 3,500 and 4,000 feet in altitude, but certain points are as high as 5,000 feet. These altitudes are the highest of any in the lower Yangste River Basin. There are numerous temples and pagodas situated in the mountains, usually surrounded by

areas not molested by woodcutters. Except for such isolated forested tracts and deep inaccessible ravines, the mountains are denuded of timber. Comparatively recent acquisitions of estates by foreign residents and the even more recent interest of the Chinese government in reforestation have added several more forested areas to Lushan. These, from a herpetological standpoint, are invaluable as collecting sites for certain species. The larger valleys in the foothills of Lushan are given over to the growing of rice. Most of the smaller valleys and gorges are so precipitous or so subject to violent torrents following rains as to make them unsuitable for agricultural use.

The climate of this area is typical of central China in that extremes of temperature are great. In Kiukiang, the average mean yearly temperature is 17.4° C. The lowest mean temperature, 4.7° C., is in January; the highest, 29.8° C., is in July. The mean temperatures in the mountains, for which figures are not at present available, are lower by possibly three or four degrees. Often, in winter storms, the trees and brush in the mountains become heavily encrusted with ice.

Figures for rainfall in Lushan also are not available at present. In Kiukiang the average yearly total is 1,465.7 mm. The heaviest rains are in June (242.7 mm.), and the lightest precipitation occurs in December (43.3 mm.). Although these figures are high, they give no indication of the exceedingly heavy precipitation on the mountains. The low but hilly regions east of Poyang Lake average over 2,000 mm. of precipitation per year. Probably the rainfall on the summits of Lushan is even greater. The average number of rainy days per year in Kiukiang is 123.5. Rain falls at any season of the year; droughts of six weeks or longer are unusual.

From a physiographic point of view the area may be divided into three simple divisions, the plains, the mountains, and a transitional zone between them, the foothills. The plains include the floors of the larger valleys, up to elevations of 100 or 200 feet; these are extensively used for the cultivation of rice and also include the slightly elevated areas away from the hills which are surrounded by irrigated lands. The foothills include the outlying, more highly elevated areas and the valleys and ridges at the base of the mountains up to approximately the 1500-foot level. The mountains comprise those regions above this level, or more particularly the steeper slopes, the summit ridges and the high valleys. A crude indication of the relative frequency of species in the various zones is indicated by the numbers of asterisks in the appropriate column of table 1. Also included in the table are the earliest local records of the species, with the name combination under which the form was recorded. Of the 29 species known to inhabit the region, *Natrix percar-*

inata, *Dinodon flavozonatum*, *Elaphe porphyracea nigrofasciata*, and *Trimeresurus mucrosquamatus* are here recorded with certainty for the first time.

TABLE 1.
DISTRIBUTION OF THE SNAKES OF THE KIUKIANG-LUSHAN REGION

Species	Plains	Foot-hills	Moun-tains	First record from the area			
				David, 1873	Guenther, 1888, also in Pratt, 1892	Stanley, 1914, 1915-1920	Chang, 1936
<i>Sibynophis chinensis</i>			*				<i>S. collaris chinensis</i>
<i>Natrix annularis</i>	**	*			<i>Tropidonotus annularis</i>		
<i>N. percarinata</i>		**	*				
<i>N. tigrina lateralis</i>	*	*		<i>Amphiesma tigrinum</i> <i>Tropidonotus lateralis</i>			
<i>Pseudoxenodon nothus</i>		*	**			<i>Pseudoxenodon macrops</i>	
<i>Plagiopholis styani</i>			*			<i>Trirhinopholis styani</i>	
<i>Achalinus spinalis</i>		*	**	"elapoid"			
<i>Lycodon ruhstrati</i>			*		<i>Ophites septentrionalis</i>		
<i>Dinodon flavozonatum</i>			*				
<i>D. rufozonatum</i>	*	*	*	<i>Lycodon rufozonatus</i>			
<i>Zaocys dhumnades dhumnades</i>	**	*			<i>Zaocys dhumnades</i>		
<i>Ptyas korros</i>	not rep. in collection				<i>Ptyas korros</i>		
<i>Elaphe bimaculata</i>		*			<i>Elaphe dione</i>		
<i>E. carinata</i>		*			<i>Elaphe sauromates</i>		
<i>E. mandarinus</i>			*	<i>Elaphe conspicillatus</i>			
<i>E. porphyracea nigrofasciata</i>			*				
<i>E. rufodorsata</i>	***	*			<i>Coluber rufo-dorsatus</i>		
<i>E. taeniurus</i>	*	*	*	<i>Elaphe virgatus</i>			
<i>Ophedrys major</i>	*	***	**		<i>Cyclophis major</i>		
<i>Oligodon chinensis</i>					<i>Simotes chinensis</i>		
<i>Calamaria septentrionalis</i>		**	*?	1872 description			
<i>Bungarus m. multicinctus</i>	not rep. in collection			<i>Bungarus semifasciatus</i>			

Species	Plains	Foot-hills	Moun-tains	First record from the area			
				David, 1873	Guenther, 1888, also in Pratt, 1892	Stanley, 1914, 1915-1920	Chang, 1936
Calliophis maclellandi		*	***		Callophis annularis		
Naja naja atra	*? not rep. in collection			Naja tripudians	}	Amblycephalus sp.	Amblycephalus chinensis A. boulengeri
Pareas chinensis	not rep. in collection		*?				
P. boulengeri			*				
Agkistrodon halys	**	**	*	Trigonocephalus blomhoffii	}	Trimeresurus sp.	Trimeresurus gramineus stejnegeri
Trimeresurus mucrosquamatus		*					
T. s. stejnegeri		*	*				

It will be seen from this list that most of the mountain and plains forms extend into the intermediate zone, the foothills. Only three species are at present known to occur only in the foothills; these are *Elaphe bimaculata*, *E. carinata*, and *Trimeresurus mucrosquamatus*. Further collecting will probably demonstrate that the first two also occur on the plains.

This division of the area into altitudinal zones does not take into account the ecological variables concerned in the restriction of the various species. Clues as to the controlling factors in certain of the species appear when the habitat choice of the same species in different areas is considered. Certain mountain inhabiting species of southern and western China when present in central China are found to inhabit the foothills and plains, or at least to occur at very much lower altitudes. This trend is still more marked when the same species are considered in northern and eastern China where they exhibit a still greater restriction to lower levels. The following species fall into this category: *Achalinus spinalis*, *Zaocys dhumnades*, *Elaphe carinata*, *Opheodrys major*, *Oligodon chinensis*, *Calamaria septentrionalis*, and *Trimeresurus stejnegeri*. In connection with this altitudinal distribution as correlated with latitudinal distribution it should be pointed out that collecting records indicate that *Natrix tigrina lateralis* is definitely a snake of the foothills and plains in the Lushan region, yet it ascends to considerable altitudes in both northern and southern China. Pope (1935, p. 292) states that in central China *Oligodon chinensis* occurs on open plains and plateaus; but both the specimens included in this collection were captured in the foothills. In southern China *Trimeresurus stejnegeri* appears to be a mountain species, but altitude apparently is of little significance in Lushan, for the snake is found distributed generally throughout the hilly regions. Its distribution is more directly correlated with the presence of bushes and low trees.

Certain species, namely *Sibynophis chinensis*, *Plagiopholis styani*, *Achali-*

mus spinalis, *Lycodon ruhstrati*, *Dinodon flavozonatum*, *Elaphe mandarinus*, *Elaphe porphyracea nigrofasciata*, and *Calliophis macclellandi* are typically montane throughout the greater part of their ranges. *Sibynophis chinensis* and *Achalinus spinalis* do occur at low altitudes in eastern China; the latter also descends into the lower slopes of Lushan and for this reason has also been considered with those snakes whose altitudinal distribution is correlated with latitude. *Calliophis macclellandi* also is found at fairly low elevations. Pope (1935, p. 343) states that Mell has informed him that this species occurs in open level country about Pingsiang, Kiangsi. He accounts for this habitat choice on the grounds of the northern position of the station, yet in Lushan, 150 miles to the northwest, it is quite obviously a mountain form. In all the foregoing species, then, mean temperature as a controlling factor in their distribution is relatively unimportant in that north or south they occur at similar altitudes. This, *per se*, indicates that they possess a wider degree of temperature tolerance with a lower threshold than other snakes inhabiting the same geographic areas. With the exception of *P. styani*, *A. spinalis*, and *C. macclellandi* these species are relatively rare and their habits little known. It is then impossible to say what environmental factor is dominant in controlling their distribution. *Plagiopholis styani* and *A. spinalis* are known to feed on earthworms and both inhabit damp hardwood forests with their accompanying deep humus floors. *Calliophis macclellandi* is found in the same situations but it is ophiophagous. Both *C. macclellandi* and *P. styani* are fossorial snakes whereas *A. spinalis* apparently is not. The latter, however, is extremely delicate and especially subject to desiccation. It is quite likely that its range of tolerance for humidity is unusually narrow. While there is no direct evidence as yet that *C. macclellandi* feeds on these two small species, nor on the small *Sibynophis chinensis* and *Calamaria septentrionalis* which are found in the same habitat, the presence of these five species together suggests that they form part of a distinct hardwood forest community. *Calliophis macclellandi* plays the part of vertebrate predator; its prey may differ in different localities, but its status in the community remains the same.

The only species which may be described as being typically snakes of the plains are *Natrix annularis* and *Elaphe rufodorsata*. Both species are water snakes and occur in great abundance in paddy fields and irrigation ditches all around the mountain. *Natrix annularis* ascends into cultivated valleys in the foothills but is always associated with still or slow moving water. It shares this habitat with *Natrix tigrina lateralis* which, however, is frequently found some distance from water, although clearly associated with it.

The two other common water snakes of the region are typically found in pools or cascading streams. These species, *Natrix percarinata* and *Pseudoxenodon nothus*, show little altitudinal preference. The former is found in

similar situations in southern and western China. In areas other than Lushan nothing is known of the habits of *P. nothus*.

Of the remaining species known to occur in the region but not mentioned above, *Dinodon rufozonatum*, *Elaphe taeniurus*, *Pareas boulengeri*, and *Agkistrodon halys* are apparently eurytopic both in Lushan and elsewhere. All of them with the exception of the amblycephalid are quite common. The latter seems to be restricted to forests but its rarity makes such a classification hardly warrantable. *Ptyas korros*, *Bungarus m. multicinctus*, *Naja naja atra*, and *Pareas chinensis* are not represented in the collection and no precise data regarding their habitats in the region is available, but from indirect evidence it appears that *Naja naja atra* is a snake of the plains.

More specific details concerning the habits and habitats of the species and the morphological variations exhibited by them are included in the following annotated list. When possible the observations of other workers have been verified. Variations have been discussed at some length with the hope that these observations may be integrated with those of others and make for a clearer understanding of the geographic variations in behavior and morphology of the Chinese snakes represented in this region.

METHODS AND MEASUREMENTS

Unless otherwise stated, all measurements of length are in millimeters. The ventral scale count is made from the first median unpaired scale on the throat to and including the scale immediately preceding the anal plate or plates. If any ventrals are partly divided, paired, or incompletely traverse the ventrum, they are counted as a single ventral. Subcaudal counts are begun on the first pair of scales in contact with each other posterior to the vent; or, when the subcaudals are single, the first median subcaudal posterior to the vent. The terminal scale is included in the subcaudal counts regardless of whether the subcaudals are single or paired. The first number of the scale row formula represents the number of rows at that point on the neck where the circumference of the neck is smallest; in the event that the head is not distinct from the neck, the count is made one head-length posterior to the head. The last number in a scale row formula represents the number of rows one head-length anterior to the vent. The remaining numbers in the formula represent the number of scale rows found at as many points as numbers are given, these points dividing the intervening body into equal lengths. When numeric formulae of oculars, labials, and temporals are given, the left-hand number represents the number of plates on the left side of the animal; the right-hand number, that of the right side. When

measurements of identical structures are given in the text for two or more animals, the order in which they are given corresponds to the order of the catalog numbers initiated at the head of that species account. All subsequent comparative measurements are given in the same order. In various places the following abbreviations have been used: v, ventrals; sc, subcaudals; jv, juveniles. Descriptions and drawings of hemipenes are based on hemipenes that have been dissected free of the tail, opened longitudinally opposite the sulcus spermaticus and stretched out flat. All the figures of the dorsal and lateral views of the heads of snakes are tracings of photographs of alcoholic specimens. Unless otherwise indicated, catalog numbers refer to specimens in the Museum of Vertebrate Zoology, University of California.

In addition to the specimens in this collection the small collections of the Kuling Library and the Kuling American School were examined.

ANNOTATED LIST OF SPECIES

Achalinus spinalis Peters

This series consists of five specimens, Nos. 22167–22169, Kuling American School Collection No. 28, and Kuling Library Collection No. 4. No. 22167 is a female; the other four are males.

TABLE 2.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Achalinus spinalis*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	4	150–153	151.7	1.6	Maslin
	♀	1	162			Maslin
		5	156–164			Chang, 1936, p. 328
		2	152,175			Chang, 1936, p. 328, types of <i>Ophioclaps braconniere</i> Sauvage, 1877.
Subcaudals	♂	4	61,60,59,60	60		Maslin
	♀	1	49			Maslin
		5	45–57	49.6		Chang, <i>loc. cit.</i>
		2	59,52			Chang, <i>loc. cit.</i>
Tail ratio	♂	4	.22,.20,.20,.20			Maslin
	♀	1	.15			Maslin
		5	.16–.21	.178		Chang, <i>loc. cit.</i>
		2	.20,.16			Chang, <i>loc. cit.</i>

Inasmuch as the hemipenis of this species has not been adequately described, I here include a description and figure of the organ: Hemi-

penis thin-walled, slender, extending to 16th subcaudal; sulcus deep, extending to tips of organ, forked just proximal to hemipenial fork; lips of sulcus massive in basal half of unforked region, these lips and adjacent regions covered with minute folds; lips in distal portion of unforked region less massive, still secondarily folded; arising from sulcus lips distal to fork, high, thin folds extend diagonally around organ, meeting

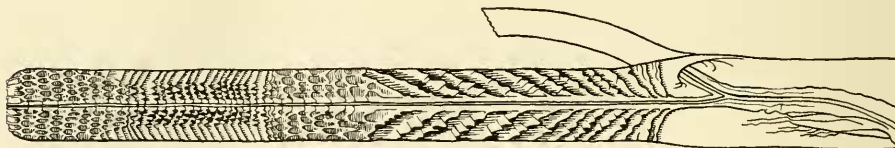


Fig. 1. *Achalinus spinalis*, left hemipenis of No. 22169, $\times 4\frac{1}{2}$.

on wall opposite sulcus; these folds slightly flounced, edges sharply but minutely serrate; more distally, low longitudinal connecting folds appear, thus forming typical calyces; one-half distance toward tip of fork, calyces become smaller and shallower, with thicker septa; tip of organ with deeper calyces, edges of septa weakly papillated, almost smooth; just proximal to tip of organ sulcus lips raised into two basally directed pocket-like flaps; sulcus lips elsewhere ornamented as adjacent regions.

A compilation of the records of the relatively few specimens that have been sexed seems to indicate that the ventral counts show considerable variations, as Pope (1935, p. 184) has noted. But in each locality there is a definite sexual difference, the females having on the average ten more ventrals than males. The subcaudal counts are even more definitely segregated. In the species as a whole the males have from 50 to 61 subcaudals, the females 39 to 54. In any specific locality, however, there is a distinct difference with no overlapping (Pope's 1935 Chungan Hsien series offers the only exception to date). There is a difference in tail per cent between males and females; my single female has a tail .15 of the total body length; the males average .20. These figures agree with other records. The above differences have been noted by Pope (1935, p. 184) and others; but no mention has been made of the differences in the anal regions. In males, the scales of this region are slightly knobbed and very much reduced in length, so that the general pattern of long slender scales is suddenly broken by these pebble-like scales about the vent.

Habits and habitat: The animals which I caught alive, three in all, were captured at night on the roads of Kuling at an altitude of 3500 feet. They were close to streams and damp humus soil. I have observed others, badly

crushed, lying on the ground as though they had been stepped on inadvertently, not deliberately killed. These dead snakes were curiously desiccated, which corroborates Pope's (1929) observation that after death they quickly dry up without putrefying. Alive, the snakes are extremely docile, soft and delicate to the touch. The scales are highly iridescent, and over the rich brown of the body this iridescence is beautifully accentuated. The female, caught on the 28th of June, 1936, contained six eggs, the largest being 15 x 6 mm. The natives of this region say they do not see this snake on the plains, but often find its crushed remains on the mountain paths.

Remarks: The variations in the stripe on the back may have some taxonomic significance. The Lushan form has an unusually wide stripe (three entire median scale rows), whereas Chang and Fang's (1931, p. 264) Nanking specimen has a stripe inclusive of but one median row. Pope (1929, p. 435) found that the majority of his Fukien snakes were similar to the Nanking form, but that two had a stripe twice as wide. Stejneger (1907, p. 297) found that the Japanese variety was of this latter type. Chang's (1936, p. 327) specimens from the same locality as the present series also have three scale rows involved in the stripe, while Boulenger (1893, p. 309) found no stripe at all on certain Ichang forms ("*Achalinus braconicri*"). As yet there are not enough records concerning this point to warrant conclusive geographic correlation.

Sibynophis chinensis (Guenther)

Two specimens, females, numbered 21927 and 21928, from Lushan, Kiangsi, China.

TABLE 3.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Sibynophis chinensis*

No. and sex	Ventrals	Anals	Subcaudals	Source
2 ♀	180-179	1	101+-108	Maslin
2 ♀	170-175		74+-81+	Chang, 1928, p. 321

Habits and habitat: Both specimens were found in Kuling at an altitude of 4000 feet, in tall grass and brush adjacent to forested areas. The stomachs have been examined; one contained a few reptilian scales (*Takydromus*), the other was empty. Pope (1929, p. 390) also found that his specimens had eaten lizards.

Remarks: These two specimens possess the diagnostic characters which Pope (1935, p. 85) used to separate this species from *S. collaris*. There are two anterior temporals on each side, and 9-9 supralabials, the lower anterior temporal thrusting itself between the seventh and eighth labial but not reach-

ing the lip. The dark bands on the head are most indistinct; the band crossing the posterior third of the parietals as described by Pope (*loc. cit.*) is, in these specimens, completely confluent with the nuchal or occipital band. The subcaudal counts are high in these specimens; in No. 21927 a few terminal scales are missing but the number of subcaudals is still within the range for *chinensis*. The color pattern of the head, especially the labial and nuchal pattern, is

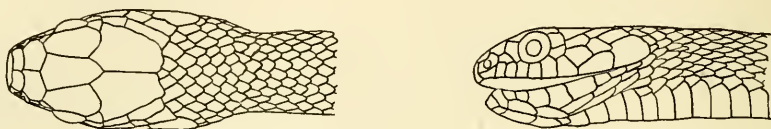


Fig. 2. *Sibynophis chinensis*, No. 21928 ♀, dorsal and lateral view of the head, $\times 2$.

strikingly like that of *S. grahami*, in that the nuchal white collar is not crescentic as it is in *chinensis*, and in that the white labial band is broken up anterior to the eye into posteriorly pointing V-shaped marks; but, as Pope (1929, p. 390) has pointed out, the color pattern in this species is extremely variable.

Natrix annularis (Hallowell)

A series of 110 specimens, numbered 21929 to 22038 inclusive; the series consists of 6 male and 12 female juveniles plus 51 male and 41 female adults. No. 21929 was obtained in October, 1935; all the others were collected between the dates of May 7 and June 7, 1936, in the foothills and plains about Lushan.

TABLE 4.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Natrix annularis*

	Sex	No.	Extremes	Mean	Standard Dev.	Remarks
Ventrals	♂	57	150-165	155.1	2.3	
	♀	53	143-159	149.0	2.7	
Subcaudals	♂	38	63-72	68.2	1.87	
	♀	33	59-69	63.3	2.2	
Tail ratio	♂	33	.21-.23	.221	.006	
	♀	23	.18-.24	.213	.012	
Maximum total						
lengths	♂	3	584,589,599			
	♀	3	835,867,696			Last specimen to vent only.
Body bands	♂	57	35-45	40.0	2.2	
	♀	42	31-43	38.1	2.97	

Sexual dimorphism is marked in this species. Pope (1935, p. 97) has pointed out the difference in ventral and subcaudal counts, the greater size of the females, and the greater number of bands, especially on the tail, in males. These characters are expressed numerically in Table 2. Pope also mentions the tuberosities on the labials and chin shields in males. These tuberosities are lacking on snakes measuring less than 325 mm. in length, but are invariably present on adults.

Habits and habitat: Pope (1929, p. 394) reports that these snakes are "vicious and wild." I found them rather the contrary in this locality. When caught, they made efforts to escape, and when cornered, assumed a hostile stance, but they seldom struck. None of the females had eggs. This was to be expected, as Pope (1935, p. 99) has shown that females of this species give birth to their young in September. Specimen No. 21929, caught in October in a wide stream in the foothills, regurgitated a large loach soon after capture. The other individuals of this species were caught in habitats similar to that described for No. 21929, some in flooded rice fields. This snake does not occur in the mountains themselves.

Growth: Study of this large series has brought out several points regarding growth rates in this species. In the accompanying graph (fig. 3), the series is arranged according to length measured from snout to vent to the nearest 5 mm. Pope (1929) reports seeing a large female give birth to nine offspring, and gives the measurements of the two largest. Assuming the tail to be 20 per cent of the body, I have calculated the length to the vent of these snakes recorded by Pope and have included them in the graph. Stejneger (1907, Formosa), and Chang and Fang (1931) also record young, giving their measurements. These are likewise included. My juveniles, judging from these, must have been born the preceding fall, their present size representing probably only a month's growth or less. A large gap occurs in length, the next group being about 100 mm. longer. The first few snakes between 300 and 335 mm. have very nearly the same color pattern as the smaller snakes and the males of this length have smooth chins. It is assumed that snakes in the 300-435 mm. group are one year older than those in the 150-210 mm. group. In the males it is possible to judge the second year's growth as represented by the group about the 460 mm. lengths. The females do not show this as well, and after the third year there are no size differences which have any significance whatsoever. It is significant that the females grow much faster and become much larger than do the males. There are 22 females longer than the longest male among the 92 adults.

Remarks: There has been some confusion in the written accounts of the similar color patterns of the two closely allied species *N. annularis* and *N.*

percarinata. But a close examination of the snakes discloses considerable difference, particularly obvious in young snakes. One of the best characters for distinguishing the two forms is that in *N. annularis* the bars extend to mid-belly on the neck region, while in *N. percarinata* they do not (Pope, 1929, p. 394). Another obvious character is the shape of the bars on the dorsum. In *N. percarinata* these bars form a sub-diamond shaped loop on the back,

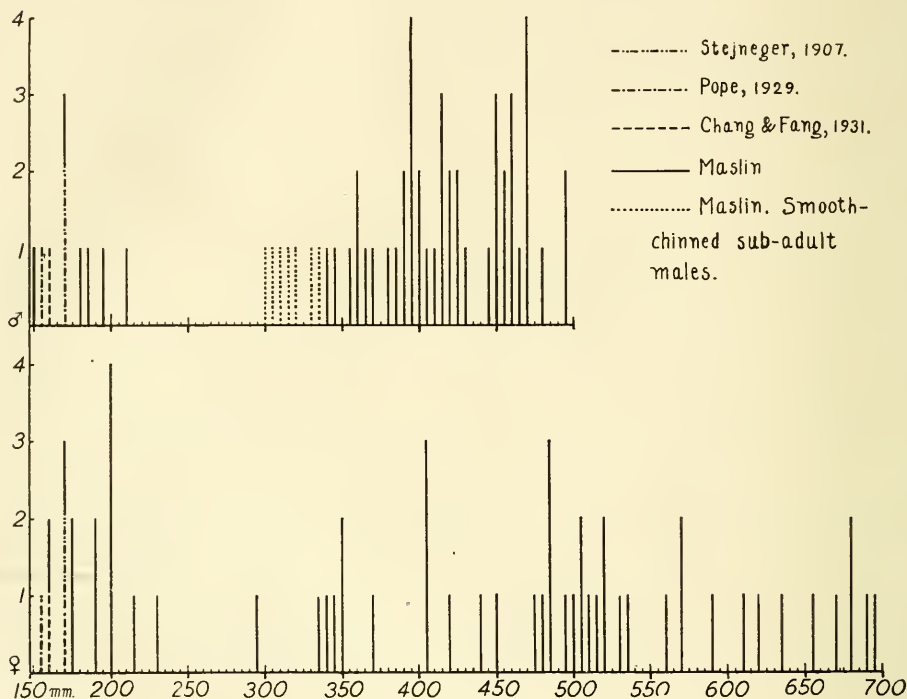


Fig. 3. *Natrix annularis*, lengths from snout to vent. Juveniles recorded by Stejneger 1907, Pope 1929, and Chang and Fang 1931, are included in both groups.

the centers being somewhat lighter than the ground color; this looping is hardly apparent in *annularis*. A good character for distinguishing specimens over 450 mm. is the color of the ventrum in life; *N. annularis* has a rich coral red ventrum, whereas that of *N. percarinata* is pale white. This characteristic, however, is nearly useless for preserved or young specimens.

In both species the black ventral bars fade considerably with age, and even disappear in some old females. But since they tend to fade from the center first, it is possible to determine their outlines even when they are almost gone. *Natrix percarinata* displays a peculiar ontogenetic color change. The ventrum of the young is a rich orange color which extends up the sides between the black bars as a deeper red orange. In this juvenile color phase

it closely resembles *N. annularis*, although the abdomen of the latter is a coral red. As *N. percarinata* becomes older, this color fades from the ventrum, and by the time the animal is a year old the ventrum is white. The lateral reddish markings persist considerably longer; one female measuring 672 mm. still had traces of this color on her sides.

Further differences between *N. annularis* and *N. percarinata* may be summarized as follows:

Rings on the tail: In *N. annularis* the tail rings are distinct and countable on even the largest snake. In *N. percarinata* after the first year the subcaudal regions become so mottled that it is almost impossible to distinguish the rings. This obliteration of the pattern is most pronounced distally but with increasing age becomes more general. In large specimens no subcaudal rings can be made out at all.

Tail ratio: Snakes with tails less than .24 of the total length are *N. annularis*, and those having tails greater than .24 are *N. percarinata*, regardless of sex.

Ventrals: *N. annularis* has a higher ventral count: ♂ 150–165, ♀ 143–159; with averages of 155.06 and 149.02, respectively. For *N. percarinata* counts are ♂ 136–142, ♀ 135–142; averages 139.55 and 138.78, respectively.

Subcaudals: *N. annularis* has a slightly lower subcaudal count: ♂ 63–72, ♀ 59–69; averages 68.2 and 63.3, respectively. *N. percarinata* has ♂ 72–74, ♀ 68–76; averages 73.00 and 71.22, respectively.

Labials entering the eye: *N. annularis* has only the fifth labial entering the eye, while *N. percarinata* has the fourth and fifth entering. This is a good character in this collection; exceptions are rare.

Labial sutures: The sutures are dark or black in *N. annularis* and are undifferentiated from the rest of the labials in *N. percarinata*.

Width of eye: The eye in *N. annularis* is as wide as the diameter of the frontal at its center. The eye is wider in *N. percarinata* when measured in the same way (Boulenger, 1899, p. 163).

Boulenger (1893, p. 233) in his catalog has given the counts of the specimens collected by Pratt. These are as follows: specimen nos. a-d (Brit. Mus.); 3 ♀ (v. 148, 147, 145; sc. 54, ?, ?); 1 juv. (v. 153; sc. 69). The above measurements increase the range of subcaudals in females from 59–69 to 54–69.

***Natrix percarinata* (Boulenger)**

This series consists of 32 specimens (nos. 22039–22070); 29 adults, 16 males and 13 females; 3 juveniles, 2 males, and 1 female. With the exception

of the three specimens they were caught between May 7 and June 6, 1936. All specimens were collected in the foothills and mountains of Lushan.

TABLE 5.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Natrix percarinata*

	Sex	No.	Extremes	Mean	Standard Dev.	Remarks
Ventrals	♂	18	136-142	139.6	1.5	
	♀	14	135-142	138.8	2.0	
Subcaudals	♂	9	72-74	73.1	1.0	
	♀	9	68-76	71.2	2.1	
Tail ratio	♂	11	.24-.28	.265	.010	
	♀	7	.25-.29	.264	.014	
Body bands	♂	16	36-43	40.0	2.0	Bands indistinguishable in the larger specimens.
	♀	9	35-42	39.0	2.3	
Juv. tail bands	♂	2	30,33			
	♀	1	20			
Maximum lengths	♂	2	608,638 mm.			
	♀	2	887,1040 mm.			

Sexual dimorphism is not so pronounced in *Natrix percarinata* as in *N. annularis* as far as body measurements are concerned, except that females are larger. But the rugosity of the anterior lower labials and chin plates is more pronounced in males of this species than in *N. annularis*. Such rugosity is found also on the upper labials, nasals, and adjacent scales of many individuals.

Habits and habitat: *N. percarinata* is more active and vigorous than *annularis* and will strike when teased. It is fond of shaded streams in the mountains but is more commonly found in the streams in the foothills. At these lower altitudes it is found with *N. annularis*. Both species, when alarmed, dive beneath the surface of the water and secrete themselves under rocks or in tangles of submerged roots.

Remarks: This series is too small to allow an adequate study of growth but it does represent a complete age sequence. The three juveniles measure 194, 264, and 266 mm., respectively, in total length, the first two being males.

Natrix tigrina lateralis (Berthold)

Of the 71 specimens in this series, 68 are numbered 22071 to 22138; the remaining 3 are in the Kuling American School collection. In all there are 24 males and 47 females.

TABLE 6.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Natrix t. lateralis*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	22	143-155	149.5	2.7	Maslin
	♀	49	144-159	152.4	2.66	Maslin
		1	151			Boettger, 1894, p. 139
	♀	1	152			Boulenger, 1893, p. 250
Subcaudals	♂	20	61-71	65.2	2.9	Maslin
	♀	37	52-64	57.6	2.7	Maslin
		1	56			Boettger, <i>loc. cit.</i>
Tail ratio	♂	20	.20-.29	.225	.012	Maslin
	♀	37	.16-.23	.191	.013	Maslin

The average ventral counts of both sexes are nearly the same. The average subcaudal counts, however, differ considerably when series are considered, but overlapping is extensive. The most obvious sexual difference with high diagnostic reliability is the sudden reduction of girth at the vent in females; in males, the body tapers imperceptibly into the tail. As Pope (1935, p. 438) has mentioned, the scales in the anal region of males are more strongly keeled than elsewhere on the body. This pronounced development is even more noticeable to the touch than to the eye. If the fingers are rubbed over this area in postero-anterior direction the scales seem rough and catch on the fingers. Another difference, variable in its distinctness, is the presence of small tubercles on the heads of males. In most specimens they occur on the upper and lateral parts of the head, with the exception of the frontal and medial parts of the parietals, but are absent from the ventral head surface. In this respect these snakes differ from others of this genus.

Habits and habitat: In agreement with Pope (1935, p. 137), I find that this snake varies in its choice of habitat. Usually it is found near streams, irrigation ditches, and paddy fields. I have taken it also several hundred yards from water on hill slopes at the base of Lushan. Sowerby (1926) states that in North China it is found at altitudes between 2000 and 4000 feet. In the Lushan area, however, it is distinctly a snake of the foothills and plains. The actions of a snake which I kept for several days in a glass box were similar to those observed by Kreyenberg (1907) and Pope (Schmidt, 1927, p. 512). Pope's description follows: "It flattened the whole body, especially the neck, and the sides of the neck were drawn down until the angle below was a right angle, or less, and the skin above was tightly stretched over the vertebrae. Just behind the head the neck was strongly arched, to such a degree as to make a fold

of loose skin appear under the head where head and neck meet. The head, held in this position, was raised from one to four inches from the ground. The body was thrown into varying but gracefully regular coils. This snake could not be induced to bite or strike, but when its body was pinched at any point it would turn and 'butt' with its nose, but not with any particular violence. Sometimes the head and arched neck would be thrown well back, and then its attitude was much like that of a cobra." In the snake I observed the head was held higher, five to six inches above the ground, and, significantly, the back of the neck was always kept facing towards me. If I circled about the snake, it carefully maintained this orientation. I say "significantly" because of Nakamura's (1935) discovery of integumental poison glands in the nuchal region of this species. He finds these glands function by rupture, their excretions being offensive in odor and irritating to mucous membranes in general. The action of the snake seems correlated with the possession of what I have termed Nakamura's glands; and the exposure of the vivid red and black pattern on the neck may serve as a warning, anticipating and discouraging attack on the part of an experienced aggressor. Smith (1938) has found similar glands in a number of other species.

Remarks: The series here reported on does not differ from those described by Schmidt (1927), Pope (1929), or Chang and Fang (1931) in any significant way. The ventral counts most closely resemble series from Anhwei, whereas the subcaudal counts are more similar to the northern and extreme southern types. The longest males in this series measure 754 and 668 mm.; the longest females, 778, 764, and 749 mm. These are not large compared with the measurements made by Chang (1932) and others, who have records of 1031 and 1090 mm. for total length.

***Pseudoxenodon nothus* H. M. Smith**

Of 17 specimens, 15 are numbered 22139–22153; one, No. 18, is in the Kuling American School collection; and one, No. 2, is in the Kuling Library collection. All specimens were collected in Lushan.

Description: Head broad, distinct from body; body cylindrical, skin of neck loose, dilatable; tail moderate (see table 5); scales keeled, weakly on neck (five or six scale rows smooth in this region); posteriorly all rows keeled; scales arranged in 19–17–15 rows, reduction to 17 rows occurring between 61st and 74th ventral, reduction from 17 to 15 invariably occurring within ten ventrals posterior to the first reduction; anal plates large; subcaudals paired; occasionally ventrals immediately anterior to vent are divided.

TABLE 7.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Pseudoxenodon nothus*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	12	138-145	142.7	1.8	Maslin
	♀	5	145-150	146.4	2.3	Maslin
		5	141-150?	(4) 143.5		Chang, 1936, p. 324
Subcaudals	♂	10	60-66	62.7	2.0	Maslin
	♀	3	57,58,59			Maslin
		5	43?-63	(4) 59.8		Chang, <i>loc. cit.</i>
Tail ratio	♂	10	.19-.21	.203	.007	Maslin
	♀	3	.18,.19,.20			Maslin

Rostral almost twice as broad as high, clearly visible from above; internasals slightly shorter than prefrontals, as wide as inter-prefrontal suture; frontal as long as distance from it to rostral; broad anteriorly, greatest breadth equalling length of lateral edge; parietals large, longer than frontal; supraorbitals twice as long as wide. Nostril large, touches internasals; posterior nasal broadly in contact with prefrontal, this suture twice as long as posterior nasal-internasal suture; loreal quad-

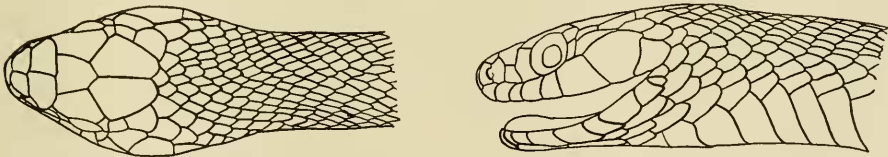


Fig. 4. *Pseudoxenodon nothus*, No. 22145 ♀, dorsal and lateral view of the head, x 1.

rangular, much longer than high; preoculars 1-1, 1-2 in one female; postoculars varying from 2-2 to 4-3, normally 3-3, upper largest, in contact with parietals; temporals 2+2, occasionally a third posterior temporal is present. Supralabials 8-8, occasionally six or seven on either side, fourth and fifth entering eye, seventh largest; infralabials 9-9, variations from 8-8 to 11-10 in eight specimens; four or five labials in contact with anterior chinshields; posterior chinshields equal to or larger than anterior, widely divergent posteriorly.

Ground color of head tan-gray; an indistinct interorbital bar of darker gray markings lies across posterior edges of prefrontals; frontal marked by several dots of a similar dark gray; starting from posterior tip of frontal a parabolic mark of gray reaches to sides of neck; this mark has a clearly defined anterior edge, posterior edge fades to a reddish gray; a dark gray chevron is superimposed on this reddish portion, its arms extending to tenth ventral; posteriorly, edge of chevron bor-

dered with a narrow, but conspicuous, light gray stripe similar in color to centers of dorsal spots (see below); postorbital streak extends from eye to corner of mouth; posterior edges of first five supralabials edged with black, this color not touching lips; scales of dorsum rich gray, with intervening irregular cutaneous pattern of black and light gray, this pattern usually embracing basal edges of scales; a row of 21 black-bordered light gray marks of irregular shape extends down back; anteriorly these are diagonal bars about four scale widths long and one scale width wide, posteriorly bars become shorter, wider, more irregular; from one tail length or less anterior to vent a black-bordered stripe similar in color to dorsal spots extends to tip of tail; scales of neck not entering into chevron mark are red or yellow basally with gray tips, this color extending posteriorly down sides, disappearing at mid-body; ventrum anteriorly spotted with large, diffuse black smudges; beginning sparsely about two head lengths down body, bases of ventrals become speckled with black, these speckled areas extending laterally to posterior edge of each ventral, thus forming a distinct but mottled line extending to tip of tail; anals and ventral anterior to them conspicuously lighter than adjacent scales.

Maxillary teeth number 24 to 26, arranged in two groups; anterior group consists of strong, slender conical teeth, anterior few smallest, remainder subequal; posterior group consists of two large teeth preceded by a short gap, these teeth twice as long as teeth of first group. Lateral processes of maxillary small, subequal; dorsal surface of bone undulated.

Hemipenis forked, extends to seventeenth subcaudal; sulcus shallow, proximally paralleled by minute folds without spines; this region followed by an area in which sulcus is deeper, with spinous lips, paralleled on each side by a large fold covered with small soft spines; sulcus forks

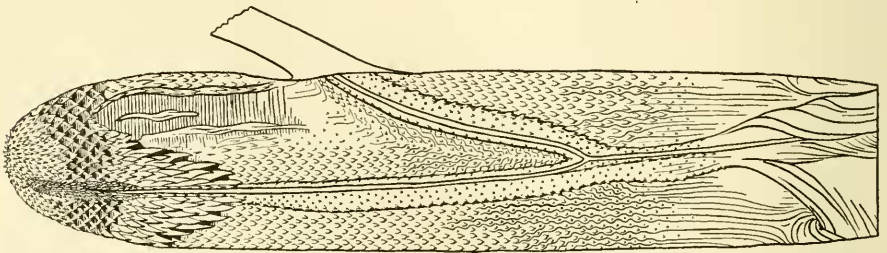


Fig. 5. *Pseudoxenodon nothus*, right hemipenis of No. 22142, $\times 4$.

at sixth subcaudal; hemipenis forks at the twelfth; immediately distal to this fork in each branch large folds of main canal give way to dense masses of large, hard spines, and a similar mass lies on opposite side of

sulcus; these masses gradually diminish in size, giving way at tip to minute calyculations; edges of distal calyces deeply serrated, appearing like densely crowded, soft spines; sulcus ends in raised fold near tip of organ; calyculate area and immediately proximal spines extend completely about hemipenial wall; more proximal spiny areas lie in two masses on either side of sulcus, as mentioned above.

In common with *P. striaticaudatus*, the largest snakes are males, the two largest measuring, respectively, 736 and 731 mm. The largest females are 645, and 584 mm., respectively. Of the 12 males examined, 10 have knobbed scales in the cloacal region; the other two are young snakes measuring, respectively, 405 and 531 mm. There is a correlation between body length and the size of the knobs, the largest snakes having these knobs better developed. The males have slightly fewer ventrals and more subcaudals than do the females. There is also sexual chromatic dimorphism; the females have reddish neck areas, and the males yellow with no trace of red.

Habits and habitat: These snakes are mountain-stream dwellers, foraging in the streams or on the banks close by. Some of the specimens were caught near streams in the foothills. The altitudinal range of these snakes varies from 500 to 4000 feet. When cornered, they invariably coil and dilate the skin of the neck region, exposing the vivid red or yellow pattern. When caught, they strike or writhe about with great energy. Their hibernation period apparently extends from late October to the latter part of April. None of the 5 females examined was gravid.

Remarks: *Pseudoxenodon nothus* has been named by Hobart M. Smith (1942). This species is obviously closely allied to *P. striaticaudatus* in that it has the lineate tail which separates it from the other mainland forms. This series differs from typical *P. nothus* in having a higher ventral count and in having 17 scale rows for only a short distance, about ten ventrals, at the mid-body. In coloration, however, it is remarkably similar to typical *P. nothus*. It differs from *P. striaticaudatus* in having 19 scale rows anteriorly and in having a red or yellow coloration about the neck regions.

Another point of difference between this species and *P. striaticaudatus* is the shape of the dorsal spots. These are large and diamond-shaped in *P. striaticaudatus*, and oblique rhombic bars in *P. nothus*. Still another point of difference is the distance the caudal stripe extends onto the body. In *P. striaticaudatus* this distance is usually from one to two tail lengths, whereas in *P. nothus* it is never longer than one tail length and may be as short as one-half a head length. There is overlapping in this character. Only seven specimens, or one-half of this series, have 4-4 labials in contact with the anterior chinshields, four have 5-5, three 5-4, and one has 4-5. Pope (1929, p. 406) points out that in *striaticaudatus* 4-4 labials are regularly in contact with the

anterior shields. Chang (1936, p. 324) shows that there is a correlation between this character and the number of lower labials: when ten of the latter are present five are in contact with the anterior chinshields. This correlation is not found in the present series. The lower labials number 9-9 in *P. striaticaudatus*, with occasionally 10 on one side.

Chang (1936, p. 321) has described five specimens from this locality. His descriptions do not differ essentially from the foregoing, but his ventral and subcaudal counts increase the range as here outlined. He has synonymized *P. striaticaudatus* and *P. nothus*, but for the reasons already established I feel that *striaticaudatus* is a perfectly valid form.

Plagiopholis styani Boulenger

Fourteen specimens, ten males and four females, caught in Kuling at an altitude of 4000 feet, Nos. 22154-22166, and one specimen in the Kuling American School collection.

TABLE 8.
SUMMARY OF COUNTS AND MEASUREMENTS OF *Plagiopholis styani*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	10	111-117	114.1	1.74	Maslin
	♀	4	119-122	120.7	1.25	Maslin
		5	112-121	117.0		Chang, 1936, p. 326
Subcaudals	♂	10	28-34	31.1	1.92	Maslin
	♀	3	26,29,30			Maslin
		5	25-30	27.6		Chang, <i>loc. cit.</i>
Tail ratio	♂	10	.12-.15	.14	.007	Maslin
	♀	3	.11,.13,.14			Maslin

There is a distinct difference between males and females in the number of ventrals. In this rather small series there is even a distinct gap between the extremes; but this would certainly be filled if more specimens were available. Pope (1935, p. 179) and Stejneger (1925, p. 77) give counts for series from Fukien and Szechwan. Here also there are sexual differences in the counts, but the Szechwan females have practically the same range as the Fukien males. The inference is that locally there is strong sexual dimorphism but in the species as a whole extensive overlapping occurs. There is also a tendency for the males to have a greater number of subcaudals. Pope (1935, p. 179) mentions that the males have keeled scales in the anal region. I find that the keeling is also present in all but one of the females in this series, but is much fainter than in the males. In some males these keels show a tendency to develop

knobs. Females show a slight but sudden reduction of girth posterior to the vent.

Habits and habitat: This snake is quite common in Kuling but for the greater part of the year is rarely seen. During the months of May and June it can easily be found in the mornings along the roads and paths about the resort. Friends on a stroll before breakfast have reported seeing as many as seven or eight of these snakes. Usually this species is associated with damp forests having brush or grassy floors. The snake is harmless, never attempting to bite or strike, but when held it may press its tail against the hand, giving a pricking sensation. Its tail and neck are unusually strong; by flexing the latter between the fingers it can exert sufficient pressure to wedge itself through. Its body form and actions in general suggest burrowing habits. An examination of the stomachs of seven specimens revealed an earthworm in one and black grit in two others; the rest were empty. One specimen had a parasitic nematode in its intestine. Two of the females had six and eight eggs, respectively. The largest eggs measured 18×9 mm., and appeared to contain very young embryos. The eggs were enclosed in extremely thin membranes. One female was caught in May, 1935, the other on June 7, 1936.

Remarks: The longest female of this series measured 396 mm. in total length and 352 mm. from snout to vent. The two longest males measured, respectively, 374 and 349 mm. in total length and 320 and 307 mm. from snout to vent. Chang (1936, p. 326) records one specimen from this region measuring 435 mm. in total length or 384 mm. from snout to vent. This is truly a large snake for this species, the usual adult length being about 350 mm.

Lycodon ruhstrati (Fischer)

One male, No. 22170, of this comparatively rare snake was collected at an elevation of 3500 feet in Kuling.

TABLE 9.
SUMMARY OF COUNTS OF *Lycodon ruhstrati*

Sex	No.	Ventrals	"	Subcaudals	Source
♂	1	210		89	Maslin
Jv.	1	211		88	Boulenger, 1893, p. 363

Habits and habitat: This specimen was taken at the west end of Kuling at an altitude of 3500 feet, some hundreds of yards from the nearest stream. It was in a clearing on a westerly facing slope where lizards abounded and

may have been hunting them when caught. The time of capture was approximately 2:00 p.m. The undigested tail of a lizard (*Takydromus* sp.) was found in the stomach. Pope (1935, p. 195) suggested that the snake was nocturnal in habits and a frequenter of streams. However, he found the remains of a small skink in one, and a species of *Takydromus* in another. So it is likely that this snake is active both day and night.

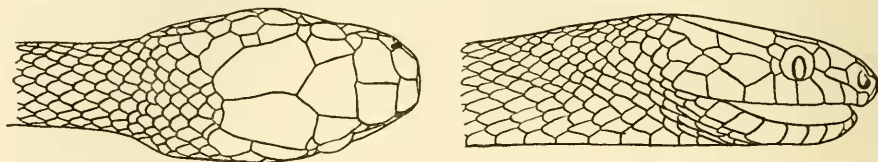


Fig. 6. *Lycodon ruhstrati*, No. 23758 ♀, dorsal and lateral view of the head, $\times 1\frac{1}{2}$.

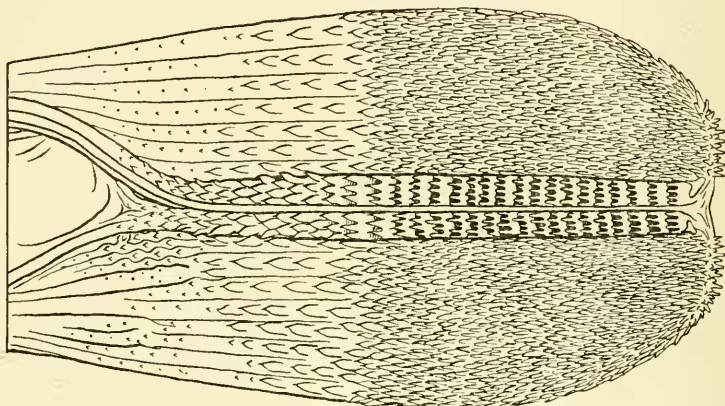


Fig. 7. *Lycodon ruhstrati*, left hemipenis of No. 22170, $\times 6$.

Remarks: While this snake is not exceptionally long, 551 mm. from snout to vent, it shows no trace of the white juvenile band across its head. Another point concerning color pattern deserves comment: at no place do the white rings, measured middorsally, become wider than the intervening black rings. Laterally, however, they are wider from a point one-third the total length from the head to a point shortly posterior to the vent, where the white stripes again become widely separated by black.

Dinodon flavozonatum Pope

One male and one female, numbers 22171 and 22172, were taken at Kuling, Lushan.

Description: Head broad, blunt, distinct from body; eyes set back from swollen lips, considerable part of lips visible from above; body compact, ven-

trals laterally angulate; tail of male .19 of total length, tail of female incomplete; scales glossy, all rows smooth on neck, posteriorly median rows weakly keeled, at vent all but first row keeled; scale formula 17-17-15; ventrals 212 in male, 105 in female; anal single; subcaudals 80 in male (almost complete), 43 in female.

Remarks: In contrasting the hemipenis of *D. flavozonatum* with that of *D. rufozonatum*, Pope (1935, p. 200) describes the tip of the organ in *flavozonatum* as being almost perfectly smooth. In my Lushan specimen this is not the case, although the papillae are much sparser and less developed than in *rufozonatum*. Furthermore, the bases of the minute spines in both species are not essentially different. The lips of the sulcus in *rufozonatum* are poorly developed at the center of the organ and pronounced distally and proximally. In *flavozonatum*, on the other hand, the lips are much better developed throughout the central and proximal portion of the organ, and nearly equal in size. Some further differences not mentioned by Pope are:

1. The proximal folds near the mouth of the organ are more numerous and more conspicuous in *flavozonatum*.
2. The hemipenis extends to the 12th or 13th subcaudal in *flavozonatum* and only to the 10th or 11th in *rufozonatum*.
3. The calycular region is absent in *flavozonatum*.
4. Distally the sulcus lips break up into numerous longitudinal folds in *flavozonatum*. In *rufozonatum* these folds are entirely wanting.
5. Opposite the sulcus near the tip of the organ there are longitudinal folds in *flavozonatum*; these are wanting in *rufozonatum*.
6. In *flavozonatum* the minute distal spines do not completely encircle the organ because of the nature of the folds mentioned above. In *rufozonatum*, however, these spines do encircle the organ.

That *D. flavozonatum* is a valid species is clearly apparent from the hemipenial differences listed above. Werner (1929, p. 59) and Chang (1932, p. 55) refuse to recognize the species, basing their opinions on external characters alone, which, except for color, are rather poor for differential diagnoses.

Pope (1935, p. 201) gives seven differences supporting the distinctness of his species. A careful comparison of the two forms confirms his conclusions in part at least. His points of difference are:

1. The hemipenes of the snakes differ.
2. Dorsal bands yellow in *flavozonatum*, red in *rufozonatum*.
3. Loreal separated from eye constantly in *flavozonatum*, usually enters eye in *rufozonatum*.

4. *D. flavozonatum* has 6 to 9 keeled scale rows at mid-body, *rufozonatum* is essentially smooth.

5. *D. flavozonatum* has a slightly higher maxillary count than *rufozonatum*.

6. *D. flavozonatum* is more slender than *rufozonatum*.

7. *D. flavozonatum* inhabits high mountain forests, *rufozonatum* is eurytopic.

The fifth and sixth points do not hold for this small series. The seventh point will need further corroboration, although both my snakes were taken in the mountains around Kuling. There are, however, a number of other differences not mentioned by Pope.

Pope (1935, p. 200) describes the dorsal transverse bands as being "about half as wide as a scale is long" in *D. flavozonatum*. Wall (1903, p. 89) describes the bands of *D. rufozonatum* as being one scale length in width. I have found this difference to hold in my series as well. The cross bands in *D. flavozonatum* are narrow, only half as wide as those of *D. rufozonatum*.

The median dorsal scale rows are composed of relatively long narrow scales. Three to four headlengths posterior to the head these scales are three-fourths as wide as they are long in *D. flavozonatum*. In *D. rufozonatum*, however, similarly located scales are equal in length and breadth, appearing broad and short.

Other differences less easily demonstrated and more variable are:

1. In males of *flavozonatum* the chin is very weakly and minutely tuberculate. This tuberculation is absent in *rufozonatum* (feebly present in one young specimen).

2. The eye of *flavozonatum* is larger than the eye of *rufozonatum*.

3. The lower postocular is relatively larger in *flavozonatum*.

4. The fifth labial is well separated from the anterior lower temporal in *flavozonatum*; these plates touch or nearly touch in *rufozonatum*.

5. The fifth labial does not extend so high behind the eye in *flavozonatum*.

***Dinodon rufozonatum* (Cantor)**

Nine specimens, Nos. 22175–22180, five males and three females; and No. 24, unsexed, in the Kuling American School collection. Specimens collected in Lushan and plains near Kiukiang.

TABLE 10.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Dinodon rufozonatum*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	5	197-211	203.3	5.3	Maslin
	♀	4	197-207	203.3	4.1	Maslin
	♀	1	203			Boulenger, 1893, p. 362
	Jv.	1	203			Boulenger, 1893, p. 362
Subcaudals	♂	2	76,76			Maslin
	♀	4	68-75	71.3	3.0	Maslin
	♀	1	72			Boulenger, <i>loc. cit.</i>
	Jv.	1	67			
Tail ratio	Jv. ♂	2	.21-.24			Maslin
	♀	3	.16,.17,.18			Maslin
Body bands	♂	5	63-86	74.0	8.8	Maslin
	♀	3	63,70,78			Maslin
Tail bands	♂	2	23,25			Maslin
	♀	3	20,22,27			Maslin
Longest specimens						
(snout to vent)						
	♂	2	795,708 mm.			Maslin
	♀	2	635,540 mm.			Maslin

In this series the males exceed the females in size. As in *D. flavozonatum* females can usually be distinguished from males by the sudden reduction in girth at the vent. The scale counts in the two sexes differ but slightly.

Habits and habitat: Pope (1935, pp. 205-207) has given an excellent summary of the known habits of this snake. My observations accord with his in every respect. His remarks on the temperament of the snake are most apt. Usually the snake is docile and easily handled, as reported by Wall (1903, p. 89) of individuals from Shanghai, but as Pope (1935, p. 207) states, "... a small percentage of individuals are treacherous—instead of striking, these more aggressive individuals simply open the mouth and quietly bury the teeth in the flesh that happens to be nearest to their jaws."

The juveniles seem rather tolerant of cold weather. They are the first snakes to appear in the spring and the last to disappear in the fall. I captured one active specimen in Kuling on November 18, 1935, at an altitude of 3,500 feet. Cold weather had already set in; nevertheless, the snake seemed healthy, though its stomach later proved to be empty. On November 26, 1935 another specimen at the same locality was dug up from boulder-filled soil by workmen digging a foundation. This snake contained the remains of a relatively large *Eumeces* almost completely digested. On February 21, 1936, Chinese collectors brought a juvenile caught among the foothills near Lien Wha Tung;

its stomach was empty. The adults were caught in May and June; their stomachs also were empty.

Remarks: This snake has been known from China for a long time and is one of the first snakes described from this country (Cantor, 1842). Subsequent notes are numerous. Schmidt (1927, p. 523) is surprised that Kiukiang specimens in the British Museum do not agree with his series from Changsha. The present series, however, does agree a little better, primarily in the number of dorsal and caudal bands. Hallowell (1856, p. 152) described this snake as having a pointed tail. None of the snakes in this series has such a tail. Usually the last scale is blunt or rounded. In juveniles the terminal scale is much elongated and slightly bulbous at the tip. This scale in most adults suggests an injury at some early growth stage. This is further suggested by the higher subcaudal counts of juveniles which have complete tails. A discussion of the differences between this snake and *flavozonatum* is included in the account of the latter species.

Zaocys dhumnades dhumnades (Cantor)

This series consists of 32 snakes, Nos. 22182–22213, 22 males and 10 females. They were taken from Lushan and its vicinity.

TABLE 11.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Zaocys dhumnades dhumnades*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	25	188–196	192.5	2.6	Maslin
	♀	10	187–197	192.3	3.0	Maslin
	♂	3	194,189,194			Boulenger, 1893, p. 376
		1	196			Boettger, 1894, p. 139
Subcaudals	♂	13	115–126	119.6	3.45	Maslin
	♀	7	112–125	118.1	4.0	Maslin
	♂	3	115,116,115			Boulenger, <i>loc. cit.</i>
		1	123			Boettger, <i>loc. cit.</i>
Tail ratio	♂	10	.27–.32	.288	.014	Maslin
	♀	7	.27–.30	.284	.010	Maslin

Pope (1929, pp. 414–415) makes an excellent comparison of this snake with *Z. d. nigromarginata*. The comparisons are based on young specimens in which the pattern is vivid and complete. In life, juveniles of *dhumnades* are extremely beautiful. The head is an orange fawn color, the upper labials a rich yellow, the ventral surface of the neck slightly lighter.

Anteriorly the dorsal scales have light yellow-green centers, at mid-body pale gray-green, and on the tail the light centers are again a light yellow-green. The ventral surface of the tail is a rich yellow. It is hard to identify such a specimen with its sombre adult color phase.

Chang and Fang (1931, p. 266) found that females had on the average slightly fewer subcaudals. These figures were based on 12 females and 6 males. In this series I, too, find that females have fewer subcaudals, but here also the series is small and overlapping is extensive. In males the tail is slightly thicker posterior to the vent. The largest males measure from snout to vent 1386 and 1398 mm.; the largest females, 944 and 986 mm.

Habits and habitat: This snake is often found about low overhanging banks near ponds, or in low brush and grass close to water. I have found several coiled up in small pockets beneath overhanging turf in banks surrounding weed- and brush-choked ponds. The skin is usually dirty with mud or dried scum. When surprised, these snakes make off with great speed, secreting themselves in dense brush, but if cornered, they form loose coils and, by inflating the body with air and slowly expelling it, make a loud hissing noise. This is repeated several times. Teasing will cause them to raise their heads and strike, hissing at the same time. As in a good many water snakes, the anal glands are well developed, and handling will often cause them to emit an offensive discharge which the animal distributes over its body and on the hands of its captor by violent writhing.

Remarks: Stejneger (1925, p. 87) and Pope (1935, p. 208) have worked out the distribution of this species. To their lists of localities may be added a point 50 miles south of Nanchang, Kiangsi (No. 22181). The snake taken here, a male, has 193 ventrals and 120 subcaudals.

Ptyas korros (Schlegel)

The only specimen of this species known from this region was collected by Pratt in 1887. Boulenger (1893, p. 384) gives the following counts for the specimen, a male: V. 166, sc. 122.

Elaphe bimaculata Schmidt

This series consists of one male, No. 22225, and three females, Nos. 22223-22224 and 22228, from Lien Wha Tung in the foothills of Lushan.

TABLE 12.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Elaphe bimaculata*

	Sex	No.	Measurements	Source
Ventrals	♂	1	191	Maslin
	♀	3	197,198,199	Maslin
	♀	1	202	Boulenger, 1894, p. 45
	Jv.	1	187	Boulenger, <i>loc. cit.</i>
Subcaudals	♂	1	78	Maslin
	♀	2	70,75	Maslin
	♀	1	68	Boulenger, <i>loc. cit.</i>
	Jv.	1	76	Boulenger, <i>loc. cit.</i>
Tail ratio	♂	1	.22	Maslin
	♀	2	.18,.19	Maslin

Comparison of the hemipenis of No. 22225 with Pope's (1935, p. 242) list of differences between *bimaculata* and *dione* brings out the following points in these Lushan specimens:

1. The organ extends beyond the 11th and 13th subcaudal plates as in typical *bimaculata*.

2. The calyces distally form papilla-like structures as in typical *bimaculata*. This is indistinct on the hemipenial walls but two such structures are well developed on the larger sulcus lip.

3. The scallops are horny and distinctly stiff and spinelike, rather than soft and fleshy, as in *dione*.

Other differences are so relative that without actual specimens of *dione* comparisons are impossible.

Pope (1935, p. 438) notes that sexual dimorphism occurs in the ventral and subcaudal counts, the females having more ventrals and fewer subcaudals than the males. In addition to these differences in the counts the tail of the females is clearly marked off from the rest of the body by a sudden reduction in girth. This change of body girth is gradual in males. Furthermore, in males the scales are faintly keeled about the vent. In females keeled scales are not found below the regular keeled scales rows.

Remarks: Schmidt (1927, p. 531) and Chang and Fang (1931, p. 274) found that anteriorly the dorsal scales are smooth. In these three snakes the keeling, although weak, begins on the neck. The cranial chevron mark in these snakes does not extend as far posteriorly as on the specimen figured by Schmidt (1927, fig. 17) but the posterior extensions do not expand into blotches, as reported of *dione*. Aside from these differences these snakes agree well with Schmidt's amplified description.

Elaphe carinata (Guenther)

Nine specimens, Nos. 22214-22222, including six males and three females
All are adults taken from the foothills of Lushan.

TABLE 13.
SUMMARY OF COUNTS AND MEASUREMENTS OF *Elaphe carinata*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	8	214-222	217.4	3.4	Maslin, Boulenger
	♀	3	213,214,215	214.0		Maslin
	♂	2	213,215			Boulenger, 1894, p. 55
	♀	1	215			Boulenger, loc. cit.
	Jv.	1	210			Boulenger, loc. cit.
		1	220			Chang, 1936, p. 330
Subcaudals	♂	7	88-95	90.9	2.9	Maslin, Boulenger
	♀	2	85,95			Maslin
	♂	2	93,87			Boulenger, loc. cit.
	♀	1	83			Boulenger, loc. cit.
	Jv.	1	86			Boulenger, loc. cit.
		1	92			Chang, loc. cit.

The hemipenes of these Lushan forms differ from Pope's description in that there are two longitudinal areas with reduced calyces and the sulcus is minutely forked at its extreme tip. Otherwise they are essentially the same. Pope (1935, p. 235) states that a Lushan specimen he examined had three folds paralleling the sulcus; only two folds were present in the specimens examined from this collection.

Sexual dimorphism is apparently absent in this species. The number of females in this series is too few to show any significant dimorphism as far as scale counts are concerned.

Habits and habitat: This snake is not found in the mountains proper but in the foothills about the mountains it is relatively common. Chang and Fang (1931, p. 275) mention that in life the snake is black and yellow. I found this to be so of all the snakes I obtained; on these the yellow is brilliant and of the same color value on all parts of the body not marked with black. Pope (1929, p. 438) remarks that specimens from Ch'ungan Hsien, Futsing, and Hok'ou are docile and easily handled. This is most surprising, for the snakes of the Kiukiang-Lushan region are exceptionally vicious. When cornered, the snake loops its neck in a tight S-shaped coil and strikes ferociously without any visible body movements prior to the strike. The mouth is held open, the head thrown back, and a slight hiss is heard as the head nears its target. Snakes kept in a glass-sided

cage would repeatedly strike at anyone passing with such violence as to necessitate moving them to cages without glass. All the snakes obtained were heavily parasitized in the connective tissue of the abdominal skin and visceral mesenteries with pseudophyllidean tapeworm larvae (*Sparganum mansoni*).

Remarks: The nomenclatorial history of this snake is complicated, primarily as a result of the great difference in color pattern of the young and adult. A description of the juvenile color pattern is here included. "General color fawn brown; a dorso-lateral line on each side of the neck, reaching and passing the first dorsal crossbar, and indicated on subsequent crossbars; a longitudinal row of narrow black spots below this; middle third of the body with somewhat irregular narrow dorsal black crossbars from ventral to ventral, mostly elongate between the 4th and 5th row to indicate a lateral line, which becomes continuous on the posterior third of the body, between the 3rd and 4th scale rows; a row of dorsolateral spots on the 7th and 8th scale rows in this part of body also tends to form a line, and continue as very distinct lines on the tail, which is otherwise uniform; most of the anterior and middle ventrals with black dots near their outer tips; venter posteriorly uniform; a few small black spots on parietals and labials.

"This specimen measures 404 mm., of which the tail occupies .18." This description is of the type of Schmidt's (1927, p. 535) *Elaphe osborni* now synonymized with *E. carinata*. In older snakes the stripes break up or are obliterated by the gradual darkening of the individual scales around their edges. In adults the lateral stripes of the neck region can sometimes be traced, but with difficulty.

Elaphe mandarinus (Cantor)

One specimen (No. 22226), a juvenile male measuring 238 + 52 mm.

TABLE 14.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Elaphe mandarinus*

	Sex	No.	Extremes	Source
Ventrals	♂	1	214	Maslin
		1	217	Chang, 1936, p. 331
Subcaudals	♂	1	73	Maslin
		1	63	Chang, <i>loc. cit.</i>

Remarks: Although this snake is widely distributed, collections contain but few specimens from a locality. Variations in scale counts, number of max-

illary teeth, temporals, and details of color pattern are extensive; but the color pattern in general and the body form of the snake are so distinctive that the species is readily recognized. Werner (1903, p. 356), nevertheless, has apparently confused it with *E. conspiculata*, a Japanese species, the juveniles of which closely resemble *mandarinus*. No. 22226 agrees well with the specimen recorded by Chang, (1936, p. 131) from Lushan. Cantor (1843, p. 483), in his original description of the type, describes the snake as "bright scarlet above, with numerous yellow lozenges, surrounded with broad, black brims, relieved with white edges; on either side a number of small irregular black marks edged with white; the abdominal surface pearl-colored, checkered with black."

Elaphe porphyracea nigrofasciata (Cantor)

One male, No. 22227, from Kuling, Lushan, 3500 feet.

Description: Head broad, rounded, barely distinct from neck; body slightly flattened dorsally; ventrals 197, obtusely angulate laterally; anal divided; sc. 65, paired, 10th–13th sc. undivided; scales smooth in 19–19–15 rows.

Habits and habitat: This snake was taken in the afternoon at an altitude of 3500 feet, in the vicinity of inhabited buildings in Kuling. The finding of it here is in line with the experience of most observers, who describe it as a mountain form.

Remarks: The hemipenis differs from the one described by Pope (1935, pp. 257–258) in that the organ extends to but the ninth subcaudal rather than the eleventh. The maxillary teeth are apparently variable in number. Pope

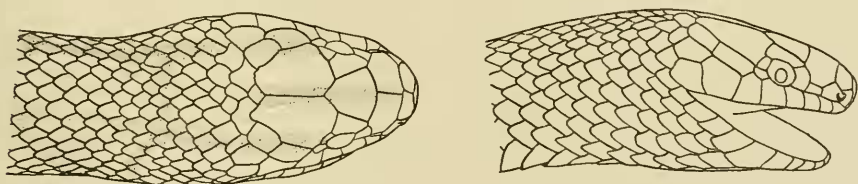


Fig. 8. *Elaphe porphyracea nigrofasciata*, No. 22227 ♂, dorsal and lateral view of the head, $\times 1\frac{1}{4}$.

(1935, p. 445) finds 22–24 and 21–20 in two specimens. In my specimen there is an ill-defined depression just posterior to the last tooth. If this be considered as a tooth socket the count is 20 (left side only). The color variation in this species deserves careful attention. Cantor (1839, p. 51) describes

his type of *porphyracea* from Assam as bright porphyry red, and his type of *nigrofasciata* (1839, p. 53) from Eastern China, a juvenile, as "a light reddish yellow." Since most subsequent descriptions have been based on preserved material, it is impossible to know what the color was in life. Red and yellow pigments are quickly leached out by alcohols, and transformed by formalin to brown or black. In spite of these changes brought about by preservation techniques, the descriptions of the ground color of many specimens from various localities, particularly in China, strongly suggest that the original color was not a bright porphyry red. Venning (1910, p. 337) describes the ground color of specimens of *porphyracea* from the Chin hills of northwestern Burma as a "rich red." Major Wall describes them as a "raw beef color." From this same locality, however, an adult was taken which was yellowish rather than red. Southeast of this locality in the southern Shan States, Wall (1901, p. 661) describes "all the adult specimens" of *porphyracea* as being "a pale brownish lilac color." This color description fits the Kiangsi *nigrofasciata* herein described. Sauvage (1877, p. 107) describes his type from "China" of *Simotes vaillanti* (*Elaphe p. porphyracea*, synonymized by Pope 1935, p. 255) as a "brown-olive." This description suggests the porphyritic color of life. Anderson's (1879, p. 812) specimens from Momein, western Yunnan, are also an "olive-brown above." Gray (1853, p. 390) describes specimens of *porphyracea* from Khassia as a pale brown. Boulenger (1894, p. 34) describes *Coluber porphyracea* (*E. p. porphyracea* and *E. p. nigrofasciata* are included in this description and considered as a single species), including both of Cantor's types, as being a pale reddish brown. Chang's (1932, p. 60) description of a Szechwan *porphyracea*, preserved in formalin, as "pale grayish" suggests the lighter phase. In general, it appears from these accounts that toward the south and west of its range the ground color of *E. p. porphyracea* is reddish, and toward the north and east the color is yellowish or fawn. In *E. p. nigrofasciata*, however, the Fukien and Hainan snakes (Pope, 1929, p. 442; Schmidt, 1927, p. 528) are reddish, whereas the Kwangsi (Fan, 1931, p. 86) and north Kiangsi snakes are a buff or fawn. When both subspecies are considered together it is seen that the lighter-colored snakes occur in a fairly coherent area between two regions occupied by the red phase. This area consists of Kiangsi, Kwangsi, eastern Yunnan, Szechwan, and the southern Shan States. The young of both subspecies are apparently yellowish, with solid dark cross-bars, as described by Roux (1919, p. 63), Schmidt (1927, p. 529), and Wall (1901, p. 611); and, as pointed out by Wall (1901, p. 611) and Sauvage (1877, p. 107), they may or may not have the longitudinal dorsal lines.

The snake herein described measures 938 mm., of which .17 is tail. It is, therefore, an exceptionally large snake. Chang (1932, p. 60) records a specimen from Szechwan measuring 892 mm.

Elaphe rufodorsata (Cantor)

Seven males, Nos. 22234, 22237-22239, 22241-22243, and eight females, Nos. 22229-22233, 22235, 22236, 22240, all collected in the plains and foothills about Lushan.

TABLE 15.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Elaphe rufodorsata*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	7	159-165	162.1	2.2	Maslin
	♀	8	169-178	174.9	2.8	Maslin
	♂	1	165			Boulenger, 1894, p. 44
	♀	1	170			Boulenger, <i>loc. cit.</i>
		1	176			Boettger, 1894, p. 140
Subcaudals	♂	5	56-63	61.0	2.8	Maslin
	♀	8	51-56	54.0	1.7	Maslin
	♂	1	58			Boulenger, <i>loc. cit.</i>
	♀	1	47			Boulenger, <i>loc. cit.</i>
		1	56			Boettger, <i>loc. cit.</i>
Tail ratio	♂	5	.19-.21	.202	.007	Maslin
	♀	8	.15-.20	.165	.016	Maslin

Sexual dimorphism is pronounced in the species. The females are much larger; the three largest females measure from snout to vent 661, 580, and 516 mm., respectively; the three largest males, 412, 446, and 387 mm. The females average a higher ventral and lower subcaudal count (see table). The average ratio of tail to total length differs in the two sexes, but overlapping is extensive. The scale rows of females are smooth or show only a trace of keeling dorsal to the vent, whereas these same scale rows are distinctly though weakly keeled in males. The sudden decrease in girth posterior to the vent is pronounced in females.

Habits and habitat: The snake inhabits rice fields and water lily swamps, and swims rapidly out among the plants when startled. Four females collected on June 7, 1936, contain 10-16 eggs, the largest measuring 16 x 7 mm.; no embryos could be detected. The stomachs of two females contain frog remains. Most of the snakes are parasitized by nematodes, which are found free or partly embedded in the walls of the stomach.

Remarks: The dorsolateral dark stripes in this series show, on the whole, but a slight tendency to break up into spots. I found only two females with the typical link-like spots described by Boettger (1886, p. 519, Shanghai), Chang and Fang (1931, p. 269, Nanking), Guenther (1864, p. 89, Chekiang), and Dumeril and Bibron (1854, p. 324, China). The ventral and subcaudal counts of this series average somewhat lower than those from other localities.

Elaphe taeniurus Cope

Twelve males and eight females, Nos. 22244–22260, Kuling American School collection No. 12, Kuling Library collection No. 3, collection of Mr. Berkin of Kuling, one specimen. These snakes were collected in the mountains and foothills of Lushan at elevations up to 4000 feet.

TABLE 16.
SUMMARY OF COUNTS AND MEASUREMENTS OF *Elaphe taeniurus*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	12	230–247	239.4	4.3	Maslin
	♀	8	238–248	243.4	3.2	Maslin
		2	286 ¹ –242			Chang, 1936, p. 332
Subcaudals	♂	9	96–108	103.8	3.5	Maslin
	♀	8	94–104	100.6	3.0	Maslin
		2	96–100			Chang, <i>loc. cit.</i>
Tail ratio	♂	7	.18–.22	.206	.012	Maslin
	♀	8	.18–.20	.193	.008	Maslin

Sexual dimorphism is but slightly expressed in this species. The two largest males measure respectively 1930 and 1905+ mm., females 1886 and 1610 mm. There are slight ventral and subcaudal differences in this series with extensive overlapping. The most obvious difference is the sudden reduction of body girth in females just posterior to the vent.

Habits and habitat: Most of the specimens of this series were caught in the daytime (collector's reports). I myself collected several at night. At this time they were timid and moved rapidly in attempts to escape. I have captured them also in the daytime in grass and brush and took one out of a low tangled tree about five feet above the ground. Pope (1929, p. 445) also reports their arboreal habit. All the snakes captured by me were near human habitations, but not definitely associated with water. This is in agreement with Chang and Fang's (1931, p. 371) findings. Wall (1903, p. 92, Shanghai), however, writes of an individual that submerged itself in water, among weeds, in an attempt to hide. Individuals kept in captivity can be irritated to the point of striking and hissing. The head is held high and usually at a slight angle. The strike is slow and clumsy, being in the nature of a butt. Further irritation causes the snake to coil tightly in a tangled ball, which can be freely handled. In this posture the head and tail are near the center. This defense mechanism has been described for other species. Normally the snake is docile and, as Pope (1935, p. 275) reports, quickly becomes accustomed to handling. One specimen contained the remains of a rat. Similar records of diet have been made by Pope (*loc. cit.*) and Chang and Fang (*loc. cit.*).

¹Undoubtedly a typographical error, possibly meant to be 236 ventrals.

Remarks: To Stejneger's (1907, p. 321) list of scutellation abnormalities and variations may be added the tendency of the parietals to break up into small plates and the extreme variations in size and shape of the rest of the dorsal plates on the head. Mocquard (1905, p. 319) reports that certain subcaudals are single in one of his specimens. Stejneger (*loc. cit.*) found that 40 per cent of the snakes he examined had 23 scale rows at mid-body. Schmidt (1927, p. 533) found that 66 per cent of the Yunnan snakes and 73 per cent of the Anhwei snakes described by him had 23 scale rows. In the twenty-two snakes from Lushan, two recorded by Chang (1936, p. 332), only 23 per cent have 23 scale rows. The eye in adults is normally not as large as Mocquard (1905, p. 319) reports, eyes relatively as large being found only in juveniles.

Opheodrys major (Guenther)

Thirteen specimens: eight males, four females, Nos. 22261–22272; and one of undetermined sex, Kuling American School Collection No. 48.

TABLE 17.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Opheodrys major*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	8	165–174	168.4	3.1	Maslin
	♀	5	168–176	172.6	3.4	Maslin, Boulenger
	♀	1	170			Boulenger, 1894, p. 279
	Jv.	1	166			Boulenger, <i>loc. cit.</i>
		3	166, 173, 177			Boettger, 1894, p. 140
	Jv.	1	170			Chang, 1936, p. 333
Subcaudals	♂	7	83–91	86.9	3.4	Maslin
	♀	1	80			Maslin
	♀	1	87			Boulenger, <i>loc. cit.</i>
	Jv.	1	82			Boulenger, <i>loc. cit.</i>
		3	82, ?, 83			Boettger, <i>loc. cit.</i>
	Jv.	1	82			Chang, <i>loc. cit.</i>
Tail ratio	♂	7	.24–.28	.260	.014	Maslin
	♀	1	.24			Maslin

Chang (1932, p. 67) reports of Szechwan specimens that the scales are "all smooth except the sixth, eighth, and tenth [dorsal scale rows] which are weakly keeled." I also find a tendency in this series for scale rows to be irregularly keeled. The keeled rows in this case are differently arranged. Just anterior to the vent the median row may be weakly keeled or entirely smooth, one or two adjacent rows on either side being keeled instead. If the median and adjacent rows are keeled, the median row is the more weakly keeled. At mid-body, the keeling, if present, is on one, three, or five dorsal rows, the median row being as strongly

keeled as those adjacent to it. None of these rows is keeled anteriorly. There is much variation in the keeling but the females tend to have fewer rows keeled than do the males. Three males are smooth throughout; only one of the females is keeled at all and here it is just at the vent on the median row. The keeling, furthermore, does not extend to the tip of each scale but ends rather abruptly one-quarter scale length anterior to the tip. A weak ridge may continue to the tip but it is inconspicuous.

Sexual dimorphism is apparently lacking in this species. Too many of the females in this relatively small series have damaged tails to give significant figures as to length. The longest males measure 868, 857, and 918+ mm. respectively; the largest females, 795, 807+, 830+, and 850+ mm.

Remarks: This snake is confused by the natives with the poisonous green pitviper, which it superficially resembles in being of a green color. For this reason it is often found badly mutilated on the mountain roads. It is found in Kuling itself, 4000 feet, and among the foothills, usually in damp forests. The stomachs of three snakes examined contained grit and segments of earthworms. This agrees with Pope's (1935, p. 286) findings. One female caught on June 6, 1936, had ten white immature eggs.

Oligodon chinensis (Guenther)

Two females, Nos. 22273, 22274, one a juvenile measuring 318 mm., and the other an adult measuring 674 mm. These topotypes along with Guenther's type (1888, p. 169) are the only three specimens collected from this locality.

TABLE 18.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Oligodon chinensis*

	Sex	No.	Extremes	Source
Ventrals	Jv. ♀	1	190	Maslin
	♀	1	188	Maslin
	♀ ¹	1	191	Boulenger, 1894, p. 228, pl. IX, fig. I.
Subcaudals	Jv. ♀	1	55	Maslin
	♀	1	57	Maslin
	♀	1	55 ²	Boulenger, <i>loc. cit.</i>
Tail ratio	Jv. ♀	1	.13	Maslin
	♀	1	.15	Maslin

Habitat: These snakes were brought in with other snakes by native collectors from the foothills (Lien Wha Tung) of Lushan. Under what circum-

¹Sex recorded by Pope, 1935, Rept. China, p. 292.

²Guenther (1888, p. 169) records 63 subcaudals; this is probably an error.

stances they were found could not be ascertained, as they were confused in the collectors' minds with *Elaphe bimaculata*.

Remarks: These specimens differ in no way from Guenther's type as far as he described it. He gives the subcaudal count as 63, but Boulenger (1894, p. 229) gives the count of the same specimen as 55. This latter count is probably correct, as subcaudals of the topotypes number 55 and 57. Schmidt

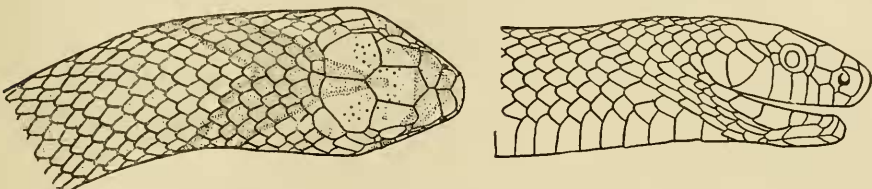


Fig. 9. *Oligodon chinensis*, No. 22274♀ dorsal and lateral view of the head, x 1½.

(1927, p. 537) describes a light median stripe and irregular black crossbands between the distinct dorsal saddles of a Yunnan specimen, and on this account suggests that there may be two varieties of *chinensis*. Guenther failed to describe these relatively inconspicuous characters, even though his type was a juvenile, where, normally, these marks are most distinct. Both the present specimens have these marks, which are particularly distinct in the juvenile. Fang (1931, p. 95) found these marks on specimens from Yoashan, Kwangsi, as did Chang and Fang (1931, p. 262) on Nanking specimens. Boulenger (1903, p. 351) mentions the crossbands, but not the median stripe, on Tonkin specimens. Schmidt's suggestion seems warranted. The type without a median stripe and extra crossbands appears to be confined to an area including Kwangtung, Fukien, Chekiang, and a part of Anhwei.

***Calamaria septentrionalis* Boulenger**

Four males, Nos. 22275–22278, taken in the foothills of Lushan in the vicinity of Lien Wha Tung from May 26 to June 12, 1936.

TABLE 19.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Calamaria septentrionalis*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	7	157–162	158.0	4.3	Maslin, Boulenger
	♂	3	161,159,148	156.0		Boulenger, 1894, p. 349
	♀	3	171,172,176	172.7		Boulenger, <i>loc. cit.</i>
Subcaudals	♂	7	15–18	17.0	1.1	Maslin, Boulenger
	♂	3	17,16,15	16.0		Boulenger, <i>loc. cit.</i>
	♀	3	9,10,9,	10.7		Boulenger, <i>loc. cit.</i>
Tail ratio	♂	4	.07,.08,.08,.08			Maslin

Habits and habitat: These snakes were taken in the foothills about Lushan and on the road up the mountain from Lien Wha Tung. But from descriptions of a "two-headed" snake by natives on the mountains it seems likely that it occurs at these higher altitudes as well. It is much feared locally, but I found it most docile. While it was being handled it made constant efforts to escape, using its head in the manner of burrowing snakes to pry my fingers apart. Fang (1931, p. 107), however, remarks that when annoyed the snake attempts to bite but can do no damage. Pope (1935, p. 307) concludes from reviewing available observations that the snake "is secretive and spends much of its time beneath the surface" of the ground. He also observed (Schmidt, 1927, p. 538) that on provocation it will feign death, and under special circumstances use its tail as a head, prodding restraining fingers with it.

Remarks: Guenther (1888, p. 169) described four specimens collected by Pratt from Lushan as *Calamaria quadrimaculata*. Boulenger (1890, p. 34), however, showed that these and a juvenile from Honkong differed from *C. quadrimaculata* and proposed the name *septentrionalis* for them. In 1894 (p. 349) he gave an amplified description of the species, with the scale counts of six specimens from Lushan, apparently Pratt's; he also figures the snake. My topotypes differ in no respect from his description and figures. But the hemipenis in these specimens differs noticeably from that described by Pope (1935, p. 307) in that the sulcus distally splits up, fanlike, into a number of secondary grooves, the folds between being papillated. Furthermore, there is a well developed lobate flap on the outer lip of the sulcus just distal to its point of forking which is very conspicuous. Apparently this structure is absent in Loshiang specimens.

Bungarus multicinctus multicinctus Blyth

Both David and Pratt record this species from this region; none, however, has been taken since Pratt made his collections. The published counts of a known Kiukiang-Lushan specimen, a male, are as follows: V. 214, Sc. 46 (Boulenger, 1894, p. 369).

Calliophis maclellandi (Reinhardt)

Seven specimens, four females and three males, from Kuling, Lushan, and the surrounding foothills; Nos. 22279-22283, Kuling American School collection No. 21, and Kuling Library collection No. 1.

TABLE 20.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Calliophis maccllelandi*

	Sex	No.	Extremes	Mean	Source
Ventrals	♂	4	205,205,206,206	205.5	Maslin
	♀	3	213,220,221	218.0	Maslin
		1	215		Boulenger, 1896, p. 399
Subcaudals	♂	4	32,38,38,38	36.5	Maslin
	♀	3	28,30,31	29.6	Maslin
		1	26		Boulenger, <i>loc. cit.</i>
Tail ratio	♂	4	.10,.10,.10,.12	.105	Maslin
	♀	3	.10,.11,.11	.107	Maslin
Body bands	♂	4	31,35,37,38	35.3	Maslin
	♀	3	34,35,36	34.0	Maslin
Tail bands	♂	3	5,6,8	6.3	Maslin
	♀	3	4,5,5	4.6	Maslin
Max. lengths	♂	2	533,542 mm.		Maslin
	♀	2	485,579 mm.		Maslin

In this small series dimorphism in scale counts is distinct, but small series from other localities show considerable overlapping, with extensive variation in both sexes. The tendency exists for males to have fewer ventrals and more subcaudals than do females. Other than this the sexes are indistinguishable.

Habits and habitats: All the specimens in this collection, with the exception of one (No. 22281), were collected at elevations above 3000 feet. The exception, a male, was collected in the foothills at Lien Wha Tung. Most of the specimens were unearthed during excavations of one sort or another about the resort of Kuling; others were found secreted behind stones or stumps in damp forested regions. Apparently the snake is nocturnal. Pope (Schmidt, 1927, p. 451) evidently concurs in this belief. Wall (1925, p. 805) described a snake which when caught by the tail at night turned to bite. In an earlier paper (1918, p. 628) he described it as apathetic. Pope (1929, p. 466) remarks that the snake acts in a stupefied manner and cannot be made to bite or strike. I have found it to act in the same way. Never having encountered it at night, I can make no comment on whether its activity is increased at that time. The stomachs of all the adults in this collection were empty.

Remarks: Of the seven specimens examined, four show no dorsal markings other than the dark rings characteristic of this species. Of the remaining three, No. 22282 has a narrow black median streak on the neck. A median stripe is indicated from mid-body posteriorly by faint black streaks down the centers of the median scales lying between the

transverse stripes. Lying on the second row lateral to the median row, and exactly between the succeeding rings on each side, there are faint black spots. These spots are clearest on the neck, lacking at mid-body, but present again posteriorly. Nos. 22280 and 22283, both juveniles, have these same lateral spots but lack the median stripe on the body; but No. 22283 does have a black median streak on the neck. Except for these inconspicuous marks, all the specimens agree with Wall's (1918, pl. XXV) beautiful colored plate of this species. The variations in color pattern in this series are the same as described by Pope (1929, p. 465) for three snakes from Chungang Hsien, Fukien. If the species is separated into subspecies, the Lushan forms should be included with those from Fukien.

Naja naja atra Cantor

The only records of this species from the Kiukiang-Lushan area are by David and Boulenger. The fact that both Pratt and I have failed to take it would indicate that it is relatively rare. This is to be expected, as Kiukiang is the most northerly record station for the species. However, several students of the Kuling American School reported seeing a dead specimen hanging in a tree in the outskirts of the town of Nan Kang to the east of Lushan. Boulenger's (1896, p. 383) record from Kiukiang, a female, has 25-21 scale rows, 166 ventrals, and 48 subcaudals (collected by J. Walley, Esq.).

Pareas boulengeri (Angel)

One male, No. 22284, captured in Kuling, Lushan.

TABLE 21.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Pareas boulengeri*

	Sex	No.	Extremes	Source
Ventrals	♂	1	183	Maslin
		2	179,181	Chang, 1936, p. 337
Subcaudals	♂	1	70	Maslin
		2	64,66	Chang, <i>loc. cit.</i>
Tail ratio	♂	1	.21	Maslin
		2	.19,.19	Chang, <i>loc. cit.</i>

Habits and habitat: This species is apparently a mountain inhabitant. Pope (1935, p. 369) records a specimen from Szechwan taken at 3000 feet. No. 22284 was captured in Kuling at an altitude of 3,500 feet. Apparently the

specimens recorded by Chang (1936, p. 335) also came from Kuling. The stomach of my specimen was empty.

Remarks: Pope (1935, p. 368) mentions three characters of *boulengeri* which he feels warrant further study. These are:

1. The imbricate condition of the anterior lower labials.
2. The relatively large size of the sixth or seventh lower labial.
3. The number of lower labials in contact with the anterior chinshields.

In this specimen all the scales of the head are imbricated, not merely the anterior lower labials. This condition is supposedly characteristic of this species. The sixth lower labial is twice as high as the fifth in this specimen, its

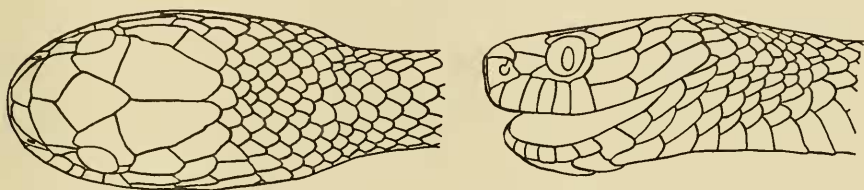


Fig. 10. *Pareas boulengeri*, No. 22284 ♂, dorsal and lateral view of the head, x 2.

length along the lip, however, is equal to that of the fifth labial. Chang (1936, p. 369) has examined Angel's (1920, p. 113) types and reports that the infralabials are 8-8 in all three specimens; furthermore, 4-4 labials are in contact with the anterior chinshields. Pope (1929, p. 459) considered a count of 9-10 infralabials, with 4-5 in contact with the anterior chinshields, on a Szechwan snake as characteristic enough to separate that specimen as a member of the species *boulengeri* from all other forms. The normal number of infralabials, however, appears to be eight. The specimen in the collection under consideration and the two reported by Chang (1936, p. 335) from the same locality all have 8-8 infralabials, with 4-4 in contact with the anterior chinshields. The first pair of labials in No. 22284 do not meet posterior to the mental.

***Pareas chinensis* (Barbour)**

This species is reported from Lushan by Chang (1936, p. 333).

***Agkistrodon halys* (Pallas)**

Thirty-nine specimens in all, 14 males and 25 females, Nos. 22285-22323; specimens numbered 22286, 22303, 22321 are juveniles measuring in total length 229, 223, 197 mm., respectively; specimens collected in region between Kiukiang and Lushan.

TABLE 22.

SUMMARY OF COUNTS AND MEASUREMENTS OF *Agkistrodon halys*

	Sex	No.	Extremes	Mean	Standard Dev.	Source
Ventrals	♂	14	134-144	138.6	2.9	Maslin
	♀	25	137-147	142.3	2.9	Maslin
	♀	3	142,138,138			Boulenger, 1896, p. 526
	Jv.	1	143			Boulenger, <i>loc. cit.</i>
Subcaudals	♂	13	37-46	40.5	2.3	Maslin
	♀	25	31-42	35.4	3.0	Maslin
	♀	3	32,29,32			Boulenger, <i>loc. cit.</i>
	Jv.	1	31			Boulenger, <i>loc. cit.</i>
Tail ratio	♂	13	.12-.15	.133	.008	Maslin
	♀	23	.10-.13	.111	.008	Maslin

Sexual dimorphism is poorly expressed in this species and is of no diagnostic value in identifying individuals. The males average a lower ventral count and a higher subcaudal count and have a slightly longer tail. Females have exceptionally large post-anal glands, their secretions so swelling the glands as to make them obvious from the exterior; but the hemipenes of males swell the basal parts of the tail in the same way, so that superficially these regions resemble each other in the two sexes.

Habits and habitat: The snake is abundant on the plains about Lushan, occurring much less commonly in the mountains, all specimens examined for stomach contents were heavily parasitized by nematodes. Normally these parasites (in preserved condition) are free in the stomach. One snake contained the remains of a frog.

When annoyed, the snake assumes an alert attitude, facing its aggressor; but no amount of teasing can induce it to strike. On several occasions I have surprised these snakes beside roads on the plains. When startled they often vibrate the tip of the tail. Instead of being held in an erect position, the tail is allowed to vibrate extended on the substratum. On dry leaves this makes a low-pitch buzzing sound not unlike that produced by rattlesnakes, but not nearly as loud or steady. Wall (1903, p. 99) and Sowerby (1930, p. 23) have also noticed this reaction. I have seen these snakes also flatten the entire body, keeping themselves as close to the ground as possible, as described by Wall (1906, p. 3). One female caught June 10, 1936, contained six eggs without embryos; the largest egg measured 23 x 12 mm.

Remarks: Stejneger (1907, pp. 449-456), Thompson (1916, pp. 61-76), and Pope (1935, pp. 390-398) have extensively discussed this widespread and extremely variable species. Thompson's (*loc. cit.*) discussion of variation in the species has convinced me as well as others that this species should be considered a single variable unit rather than divided into a number of sub-species. Pope (1935, p. 396-397) has listed in tabular form arguments for

dividing or uniting the species and subspecies, and suggests that only a field study can settle the problem. I agree with him in this suggestion. Thompson (1916, p. 68) states that *Thamnophis ordinoides* of North America presents an equally variable complex. Fitch (1940) has shown that the latter species may be divided into a number of subspecies, some of which actually inhabit the same terrain but remain distinct, owing to the different niches they occupy. Possibly the same is true of *A. halys*, but field observations required to establish this are lacking.

***Trimeresurus mucrosquamatus* (Cantor)**

Two specimens, Nos. 22324 and 22325, one male and one female, both collected in the foothills of Lushan.

Description: Head unusually large and long; crown covered with small scales; neck slender; body slightly depressed laterally, tail moderate, .19 of total length in male, .16 in female; scales posteriorly pointed, strongly keeled, outer row smooth; scale formula 29-25-19; ventrals-anals-subcaudals, 201-1-87, 212-1-78, for male and female respectively; subcaudals paired; dorsal scales dull, ventral scales and first scale row glossy.

Habits and habitat: Pope (1935, p. 418) has various records showing that the snake is often found associated with human habitations. Chang (1932, p. 71) also records specimens taken from a peasant's house in the country. Although the bite of these snakes has been known to be fatal (Maxwell, 1912, p. 244), the snake is normally reluctant to strike or bite. No amount of teasing caused the individuals now in this collection to show any signs of hostility. Pope (1929, p. 477) also found them apathetic. No. 22324, a female, contained a large, recently devoured rat. The size of this animal was prodigious, distinctly hampering the snake in its movements.

Remarks: No. 22325 has twenty-nine scale rows on the neck; this is an unusual number. Pope (1935, p. 416) states that twenty-five is normal, with occasional counts of twenty-seven. Schmidt (1927, p. 545), however, reports finding twenty-nine rows on the neck of a male from Yenping, Fukien. The specimens dealt with here are large, the male and female, respectively measuring 1057 and 1096 mm. in total length, but they do not approach Chang's (1932, p. 71) unusual record of an unsexed individual measuring 1,226 mm. The dark reticulations of the dorsal head pattern described by Stejneger (1907, p. 470) and Chang (*loc. cit.*) are lacking in these specimens. The nasals have been described as consisting of an anterior and posterior nasal on each side. This appears to be the case in these specimens, also; but careful examination proves the nasals to be fused into a single one. Just within the nostril, on the posteroventral wall, there is a fairly conspicuous pore. I (1942) have discussed the taxonomic significance of this pore in an earlier paper.

The hemipenis of this Lushan form differs notably from that of Pope's

(1935, p. 416) specimen from Yenping, Fukien, in that the organ extends only to the tenth instead of to the fifteenth subcaudal, and is forked opposite the fifth instead of the seventh.

Trimeresurus stejnegeri stejnegeri Schmidt

Five specimens, Nos. 22326–22328, females; Kuling Library collection No. 6, male; Kuling American School collection No. 31, head only. All specimens collected in Lushan and its foothills.

TABLE 23.
SUMMARY OF COUNTS AND MEASUREMENTS OF *Trimeresurus s. stejnegeri*

	Sex	No.	Extremes	Source
Ventrals	♂	1	161	Maslin
	♀	3	158,159,166	Maslin
		3	168,168,161	Chang, 1936, p. 339 and 343
Subcaudals	♂	1	73	Maslin
	♀	3	63,62,64	Maslin
		3	73,66,63	Chang, <i>loc. cit.</i>
Tail ratio	♂	1	.21	Maslin
	♀	3	.18,.16,.17	Maslin
		3	.17,.16,.16	Chang, <i>loc. cit.</i>

Sexual dimorphism, according to Pope (1935, p. 419), is evident primarily in color pattern. He pointed out (1929, pp. 480–481) that the white part of the lateral stripe of males extends to the eye or nearly to the eye, whereas in females this stripe does not extend beyond the neck; furthermore, the lateral stripe in males is usually white and red, whereas that of females is white only. As Pope himself indicated, these characters are not invariable. No. 22328, a female, has a red and white lateral line. Pope (1935, p. 419) finds little secondary sexual difference in this species as to subcaudal counts. He suggests (*op. cit.* p. 423) that owing to the arboreal habits of the snake a shortening of the tail in males would be disadvantageous. Slight differences, however, do exist.

Habits and habitat: This snake is normally arboreal. I have seen it in bushes and trees at heights of up to fifteen feet. A student at the Kuling American School, while picking azaleas, was bitten by one on the thumb. Although he wound an elastic band about the thumb until he was treated, the hand and arm became swollen. Natives from the foothills have asked my advice concerning bites by this snake. In each case the bite had been inflicted several days previously; the victims eventually recovered. Pope (1929, p. 482) reports that he has taken *stejnegeri* from streams only, which they apparently frequent at night in search of frogs. The stomachs of several specimens examined by him contained remains of frog, rat, and shrew. The stomachs of the series from Lushan were

empty. Nos. 22326 and 22328 contained seven and four eggs, respectively. The largest eggs measured 21×10 mm. (No. 22328, collected March 31, 1936).

Remarks: Stejneger (1927), in his review of the green pit vipers in China, correctly differentiated the Chinese forms. However, he considered them subspecies of *T. gramineus*, (= *T. popeorum*) a Malayan species, listing the three Chinese forms as *T. g. gramineus*, *T. g. stejnegeri*, and *T. g. yunnanensis*. Since then Pope (1933) has shown that *T. popeorum* does not extend north of Burma, and that the Chinese forms are separate species. Stejneger's *T. g. gramineus* Pope considers as one species, and the remaining two as subspecies of a second species. The only available name for the former is *T. albolabris* Gray (type locality, China), and for the latter, *T. stejnegeri stejnegeri* and *T. stejnegeri yunnanensis*.

Trimeresurus was recorded from Lushan by Stanley in 1914, but because his identification is not accompanied by a description and because I have not examined his material or been able to learn more about it than he has published, its specific status cannot be determined. Chang (1936) records *T. g. gramineus* (= *T. popeorum*: not *T. albolabris* as defined by Pope, 1933) and *T. g. stejnegeri* from the same locality. In neither case did he establish the sex of his specimens, but from his descriptions, scale count, and figures, it is likely that his *T. g. gramineus* is in reality a male *T. s. stejnegeri*. This seems particularly probable in view of the fact that *popeorum* is not known to occur north of Burma. His specimens of *T. g. stejnegeri* are correctly identified and probably are females.

The nasal pore described under *T. mucrosquamatus* is present in this species as well. Here the nostril is relatively much smaller, with an accompanying reduction of the pore. Again, it is found on the posteroventral wall of the nostril and under a lens is clearly visible when one looks directly towards the snout.

LITERATURE CITED

ANDERSON, J.

1879. Anatomical and zoological researches: comprising an account of the zoological results of the two expeditions to western Yunnan in 1868 and 1875. London. 2 vols.: 1, pp. xxv + 985; 2, pls. 1-81.

ANGEL, F.

1920. Liste des reptiles récemment déterminés et entrés dans les collections et descriptions d'une nouvelle espèce du genre *Amblycephalus*. Bull. Mus. Hist. Nat., Paris, 26:112-114.

BOETTGER, O.

1886. Diagnoses reptilium novorum ab ill. viris O. Herz et consule Dr. O. Fr. de Moellendorff in Sina meridionali repertorum. Zool. Anz., 9:519-520.
1894. Materialien zur herpetologischen Fauna von China III. Senckenberg. Nat. Ges., Bericht., 1894:129-152, pl. III.

BOULENGER, G. A.

- 1890. List of the reptiles, batrachians, and fresh water fishes collected by Professor Moesch and Mr. Iversen in the district of Deli, Sumatra. Proc. Zool. Soc. London, 1890:31-40.
- 1893. Catalogue of the snakes in the British Museum (Natural History). I. London. Pp. xiii + 448, 26 text figs., pls. I-XXVIII.
- 1894. Catalogue of the snakes in the British Museum (Natural History). II. London. Pp. xi + 381, 25 text figs., pls. I-XX.
- 1896. Catalogue of the snakes in the British Museum (Natural History). III. London. Pp. xiv + 727, 37 text figs., pls. I-XXV.

CANTOR, T.

- 1839. Spicilegium serpentium Indicorum. Proc. Zool. Soc. London. 1839:31-34, 49-55.
- 1842. General features of Chusan, with remarks on the flora and fauna of that island. Ann. Mag. Nat. Hist., 9:265-278, 361-370, 481-493.

CHANG, M. L. Y.

- 1932. Notes on a collection of reptiles from Szechwan. Contr. Biol. Lab. Sci. China, (Zool. Ser.), 8:9-95, 28 text figs.
- 1936. Snakes of Lushan (Kiangsi) collected by R. C. Ching. Contr. Biol. Lab. Sci. Soc. China (Zool. Ser.), 11:317-344, 6 text figs.

CHANG, T. H., and FANG, P. W.

- 1931. A study of the ophidians and chelonians of Nanking. Contr. Biol. Lab. Sci. Soc. China (Zool. Ser.), 7:249-288, 19 text figs.

CRESSEY, G. B.

- 1934. China's geographic foundations—A survey of the land and its people. McGraw-Hill Book Company, Inc., New York and London. Pp. xvii + 436, 197 text figs., 36 tables.

DAVID, A.

- 1871. Rapport adressé à MM. les Professeurs—Administrateurs du Muséum d'Histoire Naturelle par M. l'Abbé Armand David Missionnaire lazariste, Correspondant du Muséum. Nouv. Arch. Mus. Hist. Nat., Paris, VII, Bull., pp. 75-100.
- 1873. Quelques renseignements sur l'histoire naturelle de la Chine septentrionale et occidentale. Jour. N.-China Br. Roy. Asiat. Soc., (2)7:205-234.
- 1872. Journal d'un voyage dans le centre de la Chine et dans le Thibet oriental. Nouv. Arch. Mus. Hist. Nat., Paris, VIII, Bull., pp. 3-128.

DUMERIL, A. M. C., et BIBRON, G.

- 1854. Erpétologie générale ou histoire naturelle complète des reptiles, Paris. Vol. 7, part 1, pp. xvi + 780; pt. 2, pp. xii + 781-1536, 18 col. pls.

FAN, T. H.

- 1931. Preliminary report of the reptiles from Yaoshan, Kwangsi, China. Bull. Dept. Biol. Col. Sci. Sun Yatsen Univ., No. 11:1-154, 11 text figs., 9 pls., 1 map.

FITCH, H. S.

- 1940. A biogeographical study of the *ordinoides* artenkreis of garter snakes (genus *Thamnophis*). Univ. Calif. Publ. Zool., 44:1:1-150, 21 text figs., pls. 1-7.

GRAY, J. E.

- 1853. Descriptions of some undescribed species of reptiles collected by Dr. Joseph Hooker in the Khassia Mountains, East Bengal, and Sikkim, Himalaya. Ann. Mag. Nat. Hist., (2)12:386-392.

GUENTHER, A.

1864. The reptiles of British India. London. Pp. xxvii + 452, pls. I-XXVI.
1888. On a collection of reptiles from China. Ann. Mag. Nat. Hist., (6) 1:165-172, pl. XII.

HALLOWELL, E.

1856. Notes on the reptiles in the collection of the Museum of the Academy of Natural Sciences. Proc. Acad. Nat. Sci. Phila., 8:146-153.

KREYENBERG, M.

1907. Briefs aus China. V. Die Reptilien und Amphibien unseres Schutzgebietes. Wochenschr. Aquarienkunde, Braunschweig, 4:209-210, 224-225.

MASLIN, T. P.

1942. Evidence for the separation of the crotalid genera *Trimeresurus* and *Bothrops*, with a key to the genus *Trimeresurus*. Copeia, 1942:18-24, 2 figs. in text.

MAXWELL, J. P.

1912. Snakes and snakebite in the Fukien Province. China Med. Jour., 1912:243-245.

MOCQUARD, M. F.

1905. Sur une collection de reptiles recueillie dans le Haut-Tonkin, par M. le Docteur Louis Vaillant. Bull. Soc. Philomath. Paris, (9)7:317-322, 2 text figs.

NAKAMURA, K.

1935. On a new integumental poison gland found in the nuchal region of a snake, *Natrix tigrina*. Mem. Col. Sci., Kyoto Imp. Univ., ser. B, 10, No. 3, art. 9, pp. 229-240, 13 text figs., pl. XII.

POPE, C. H.

1928. Four new snakes and a new lizard from South China. Am. Mus. Novitates, No. 325, pp. 1-4.
1929. Notes on reptiles from Fukien and other Chinese provinces. Bull. Am. Mus. Nat. Hist., 58:335-487, 19 text figs., pls. XVII-XX, maps.
1935. The reptiles of China. Nat. Hist. Cent. Asia, 10. Am. Mus. Nat. Hist., New York, pp. lii + 604, 78 text figs., 27 pls.

PRATT, A. E.

1892. To the snows of Tibet through China. London. Pp. xviii + 268, 29 illus., map.

ROUX, J.

1919. Sur un nouveau serpent (*Simotes musyi*) provenant de la Chine. Rev. Suisse Zool., 27:61-63, 2 text figs.

SAUVAGE, H. E.

1877. Sur quelques ophidiens d'espèces nouvelles ou peu connues de la collection du muséum. Bull. Soc. Philomath. Paris, (7)1:107-115.

SCHMIDT, K. P.

1927. Notes on Chinese reptiles. Bull. Am. Mus. Nat. Hist., 54:467-551, 22 text figs., pls. XXVII-XXX.

SMITH, H. M.

1942. A new name for a Chinese snake. Copeia, 1942:52.

SMITH, M. A.

1938. The nuchal-dorsal glands of snakes. Proc. Zool. Soc. London, ser. B 108:575-583, text figs., pl.

SOWERBY, A. DE C.

- 1926. The Chinese tiger snake. *China Jour. Sci. Arts*, 4:231-232.
- 1930. The reptiles and amphibians of the Manchurian region (*in* The naturalist in Manchuria, IV). Tientsin Press, Ltd., Tientsin, text figs., pls. I-III.

STANLEY, A.

- 1914. The collection of Chinese reptiles in the Shanghai Museum. *Jour. N.-China Br. Roy. Asiat. Soc.*, (N.S.), 45:21-31.
- 1915. Acquisitions to the Museum. *Jour. N.-China Br. Roy. Asiat. Soc.*, (N.S.), 46:xii-xiv.
- 1916. Museum acquisition from June 1, 1915 to May 31, 1916. *Jour. N.-China Br. Roy. Asiat. Soc.*, (N.S.), 47:xiii-xv.

STEJNEGER, L.

- 1907. Herpetology of Japan and adjacent territory. *Bull. U. S. Nat. Mus.*, No. 58, pp. xx + 577, 409 text figs., 35 pls.
- 1925. Chinese amphibians and reptiles in the United States National Museum. *Proc. U. S. Nat. Mus.*, 66, art. 25, pp. 1-115, 6 text figs.
- 1927. The green pit viper, *Trimeresurus gramineus*, in China. *Proc. U. S. Nat. Mus.*, 72, art. 19, pp. 1-10, 2 text figs.

THOMPSON, J. C.

- 1916. The variation exhibited by *Ancistrodon halys* (Pallas), a pit-viper inhabiting the Far East. *Trans. San Diego Soc. Nat. Hist.*, 2:61-76, tables.

VENNING, F. E. W.

- 1910. A collection of the Ophidia from the Chin Hills (with notes on the same by Major F. Wall, I. M. S., C. M. Z. S.). *Jour. Bombay Nat. Hist. Soc.*, 20:331-344.

WALL, F.

- 1903. A prodromus of the snakes hitherto recorded from China, Japan, and the Loo Choo Islands; with some notes. *Proc. Zool. Soc. London*, 1903, vol. 1, pp. 84-102.
- 1906. A popular treatise on the common Indian snakes. Pt. 2. *Jour. Bombay Nat. Hist. Soc.*, 17:1-9, col. pl. II, 3 diagrams.
- 1918. A popular treatise on the common Indian snakes. Pt. 25. *Jour. Bombay Nat. Hist. Soc.*, 25:628-635, col. pl. XXV, diagram.
- 1925. Notes on snakes collected in Burma in 1924. *Jour. Bombay Nat. Hist. Soc.*, 30:805-821.

WALL, F. and EVANS, G. H.

- 1901. Burmese snakes. Notes on specimens including 45 species of ophidian fauna collected in Burma from 1st January to 30th June, 1900. *Jour. Bombay Nat. Hist. Soc.*, 13:611-620.

WERNER, F.

- 1903. Ueber Reptilien und Batrachier aus Guatemala und China in der zoologischen Staats-Sammlung in München nebst einem Anhang über seltene Formen aus anderen Gegenden. *Abh. Bayer. Akad. Wiss.*, II Kl., 22:341-384, 4 text figs., pl.
- 1929. Übersicht der Gattungen und Arten der Schlangen aus der Familie Colubridae, III Teil (Colubrinae) mit einem Nachtrag zu den übrigen Familien. *Zool. Jahrb., Sust.*, 52:1-196, 48 text figs.